



<Addendum #5>

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Date: September 17, 2012

PROJECT #: EL-0006-C01

DESCRIPTION: Elizabeth Academic High School

This addendum shall be considered part of the Bid Documents issued in connection with the referenced project. Should information conflict with the Bid Documents, this Addendum shall supercede the relevant information in the Bid Documents.

A. RFI QUESTIONS & NJSDA ANSWERS

A.1 Question: Why is there a requirement for providing signed and sealed structural calculations as indicated on page 12350-6, paragraph 1.5.C? Lab casework is a furnishing, and is not a structural component of the building structure. Can this requirement be deleted?

Answer: Provide calculation when necessary as per 12350-1.5.C

A.2 Question: Is fire retardant treated wood required to be used in lab casework construction? On page 12350-7, paragraph 1.5.2.a mentions certification submittals on fire retardant treated wood. However, the Product section of specification Section 12350 has no mention of fire treated work. Please clarify.

Answer: Fire retardant treated wood is not a requirement. Provide appropriate data if used.

A.3 Question: Is FSC certified Chain-of-Custody required for Section 12350? In reviewing Section 01115 – Sustainable Design and Construction, Credit Requirement MR 7 (on page 01115-4) does not identify Section 12350

Answer: Per 12350-1.6.D, provide FSC certified wood for lab casework.

A.4 Question: Are “no added urea-formaldehyde” materials required?

Answer: The requirement for no urea formaldehyde does not apply to casework.

A.5 Question: Is a fume hood mock-up required?

Answer: A mock-up of the fume hood is required per 12350-1.6.E.1.d.

A.6 Question: Which type of epoxy resin backsplash is required, loose applied splash as shown in drawing details 1, 3, 4 & 7/A-753 or integral coved splashes as indicated in specifications (p.12350-15, 2.5.B)?

Answer: Loose applied.

A.7 Question: Is marine edge required at epoxy resin countertops? The specifications call out for 1" thick epoxy resin tops with no mention of marine edge (12350-15, 2.5). Drawing details 1, 2, 3, 4, 6 & 7/A-753 show marine edge tops. If marine edge tops are required, is the marine edge required at all tops or at tops with sinks only?

Answer: Provide marine edge at all tops.

A.8 Question: The sink location at Elevation 7/A-611 is not consistent with the sink location shown on floor plans A-103B & A-104B in Science Labs 309 and 409. Please clarify correct sink location.

Answer: Follow sink location per plans.

A.9 Question: Is hot water service being provided to student lab tables or just cold water?

Answer: Only cold water for work tables, hot & cold for side counter sinks.

A.10 Question: Detail 2/A-753 shows (4) gas cocks per student lab table. We are assuming these are 1-way gas cocks. Can we provide (2) 2-way gas cock per lab table in lieu of (4) 1-way gas cocks?

Answer: Either (2) 2-way gas cocks or (4) 1-way gas cocks are acceptable.

A.11 Question: Provide lab sink specification and sizes?

Answer: Kewaunee model #1005-00-BK 10" H x 15" W x 25" L I.D., 0482-00 1 1/2" I.P.S. Sink Outlet, W-0340-0V Deck Mounted Hot and Cold Water Mixing Vacuum Breaker Gooseneck Faucet, or approved equal.

A.12 Question: Provide elevations of lab casework at Chemical Storage Rooms 311, 352 & 451?

Answer: Provide cabinets to fit as per elevation 19A/A-603.

A.13 Question: Elevation 7/A604 does not really match-up with the floor plan of Science Prep Room 410. Please provide correct elevations at Prep Room 410?

Answer: As noted, use similar elevation 7/A-604.

A.14 Question: Provide elevation and detail of the instructor's demonstration desk at science labs.

Answer: Provide the following for the Teachers Work Station

Kewaunee model #T31W363096 96" Instructor's Demonstration Bench &
#T35W313048 Instructor's Bench Desk with Keyboard Tray, consisting of:

#T31W363096

Sink:

(1) 1003-00 Kemresin Sink – 11" H x 15" W x 18" L I.D.

(1) 0482-BP 1 1/2" I.P.S. Sink Outlet

Electric Fixtures:

(1) 0656-01 120 VAC GFI Duplex Receptacle

Fittings:

(2) W-0337-0V Cold Water w/VB Gooseneck

(1) W-0263-00 Double Outlet Service Fitting

(2) 0548-00 Rod Sockets

(1) 4740-00 Upright Rod Assembly

#T35W313048

(1) D90W302218- 3-Drawer Cabinet w/Pull Board

(1) A80W002220-00_0 Frame with Keyboard Tray– 29" L

(1) G70W240647-00_0 Book Shelf 6" D x 26" H x 47" L

A.15 Question: Are locks required at casework? If yes, please provide locations.

Answer: Locks are required at all cabinets and drawers. Provide 5-pin locks, no lock panels, per manufacturer's standard locations.

A.16 Question: Who is providing under counter refrigerator and dishwasher at Science prep rooms? If provided by the contractor, please provide a specification or manufacturer and model number.

Answer: See Attachment #13 of this Addendum #5 (Revised Specification Section 12350 – Laboratory Casework, dated September 12, 2012 – Issued for Addendum #5).

A.17 Question: Detail 12/A-753 shows an epoxy resin countertop with a 3" bullnose apron at the Auditorium Sound Booth. Please be advised epoxy resin tops cannot be fabricated with a 3" bullnose apron. Epoxy resin tops are poured monolithically in a mold into slab forms. There are no molds available to pour an integral apron and applied apron is not an option. Please advise.

Answer: Provide plastic laminate top at sound booth.

A.18 Question: In regards to Athletic Equipment, please clarify the following:

- The plans in the gym look like they have 6 ceiling suspended basketball backstop/systems. The specifications call for both ceiling and wall mounted ones. Are any of these hoops wall mounted?

- Are safety straps required?
- What type of edge pads are required, if any?
- What type of rim?
- What type and size of backboard is required?
- The scoreboard is manufactured in Canada. Is this acceptable?
- The model of basketball backstop specified is sidefold. Do you want all 6 basketball backstops to be sidefold? TBS-26-B

Answer: The following are answered in same order as bulleted questions for Athletic Equipment:

- All backstops are ceiling mounted.
- Yes.
- Yes, Draper #503253 2" Wide Safe-edge Padding, or approved equal.
- Provide rim Draper #503576 Breakaway Basketball Goal, or approved equal.
- Provide backboard Draper # 503136 Rectangular Glass 72" x 42" Basketball Backboard, or approved equal.
- Hamilton Digital designs was the basis of design, however project must meet state codes 52:32-1 and 52:31-1.
- Yes, although the four side court backstops to be height adjustable.

A.19 Question: In regards to Telescopic Bleachers please advise the follow questions:

- On each bank, what is the total number of seats required?
- Can we design the bleachers on total seat count?
- Do the rails as specified have to be permanent, meaning no moving parts once installed, or can they move and be stored in another place when closing the bleachers?
- A 12" depth is shown for the wood seats. Is 10" acceptable?
- The nose bean shows 14 gauge for the steel. Most but one manufacturer uses 13 gauge as it's heavier and strong thus supporting the seats and decking. Is 13 gauge acceptable?
- In the wheel chair areas cutout are in the spec. This would cause a loss of seating. Is truncation acceptable therefore maximizing the seating or should we provide no seats at the ADA areas?
- Aisle Lights? They are specified and normally are not on gym bleachers?
- Understructure: please confirm that X-Bracing will not be accepted and the product should be a straight framed system
- Power requirements, i.e. 3 phase?
- First row power?
- Clear coat will not be accepted on the decking as specified?
- Both end panels and aisle closure are specified. Are both required?

Answer: The following are answered in same order as bulleted questions for Telescopic Bleachers:

- Provide bench type bleacher.
- No, provide size shown on drawings.
- Provide removable rails.
- Provide 12" seat depth.
- 13 gauge is acceptable.
- Provide wheelchair cut-outs as per documents.
- Provide aisle lights as specified.

- Confirmed, per specifications.
- Confirm power requirements with specific manufacturer.
- No.
- Yes.
- Yes.

A.20 Question: In regards to Glass and Glazing please advise the follow questions:

- Please indicate what door number is shown at 5/A-340 (lower area), between columns "D & E".
- The specification section 08900 Aluminum and Glass Curtain Wall indicates a 6" deep curtain wall system, yet the details within the architectural drawings indicate a 7" deep system. Please advise which depth is correct.
- The specification section 08910 Aluminum Windows only refers to fixed windows, is there a specification section for the operable casement windows with model type, profile depth, hardware, finish, etc.? Please advise.
- Several doors are indicated within the door schedule as H.M., but details show them as aluminum doors. Refer to 101D, 101E, 130A, & 130B.
- With reference to frame elevation 2/A-220, is this to be a H.M. frame with glass type GL07 as shown within the door schedule or 2 1/2" x 8" aluminum fire rated curtain wall frame with glass type GL02A as shown? The doors are also detailed as aluminum in lieu of H.M. as per the door schedule. Please advise.
- With reference to frame elevation "W-11" (1/A-204), will this frame remain a window as per the exterior window schedule? The detail call outs indicate a combination of stacked window wall and curtain wall. Please advise which system is to be utilized.
- Doors number 159C & 159D are called out as H.M. doors, yet they are shown as aluminum in frame elevation 2/A-220. Please advise.
- With regards to the aluminum curtain wall framing that occurs within the Courtyard Areas, is it possible that the daylight opening height dimensions be divided in two sections? Reason being, is that it will have an impact on glass pricing and field labor installation. Please advise.
- At door number 378A, it is shown as a single door on floor plan A-103A and elevation 6/A-205, yet the door schedule indicates are pair of doors is required. Please advise which is correct.
- With regards to elevation 9/A-206, it differs from what is shown on the floor plan 2/A-340. Please advise which is shown correctly.
- At the enlarged floor plan on sheet 4/A-340 there is a discrepancy in the dimensions; the plan indicates that there are 23 spaced @ 4'-0" that is equal to 87'-10 5/8".
- With reference to the door schedule in specification section # 08702, there are many wood doors that are indicated with glass type GL-11 which is designated as fire rated glazing with 45 and 60 minute rating, yet this is not always the case with many of the wood doors. Will these doors actually receive fire rated glass type GL-11? If so what, minute rating will they have? Please advise.
- There has been some concern with regards to the casement windows set within the curtain wall framing. It is specifically related to the overall size of the windows, since they are very close in size to a door opening. Consideration should be taken into account from a performance and safety standpoint since this window is be utilized within a school application.

- The operable casement windows mentioned with the specification section 08810 indicates a model designation which appears to be a captured unit, yet the details and sections show a “Zero Sightline” window unit. Please advise which type is to be selected and quoted.
- Please be advised that the frames that occur in the Courtyard Areas are utilizing fire rated glazing type GL04 (60 minute fire rating) within an aluminum curtain wall system. This will mean that a fire rated curtain wall system must be used (system may be steel in lieu of aluminum) and dimensionally may vary; also the doors will differ from the bid documents as well, is this acceptable?
- With reference to the Courtyard curtain wall frames, it has been mentioned that the sizes of the daylight opening heights for the glass may have to be reduced to meet testing and specified requirements. Please advise how we are to proceed.
- We have been advised that operable casement windows cannot be used in this application when employing a 60 minute fire rated curtain wall system and fire rated glazing. Please advise how we are to proceed.
- Many suppliers have asked to clarify the quantity of all operable casement vent windows. Are all openings to be operable? If not, please advise where the fix units are located.
- Windows frame mark W-02 through W-09 are indicated as glass type GL09, which is laminated glass, yet the details show 1” insulated glass. Which is correct?

Answer: The following are answered in same order as bulleted questions for Glass and Glazing:

- See Answer to Question A.11 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.12 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.13 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.14 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.15 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.16 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.17 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.18 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.19 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.20 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.21 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.23 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.24 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.25 in **Addendum #3**, dated September 11, 2012.
- See Answer to Question A.27 in **Addendum #4**, dated September 14, 2012.
- See Answer to Question A.28 in **Addendum #4**, dated September 14, 2012.
- See Answer to Question A.29 in **Addendum #4**, dated September 14, 2012.
- 38. Not all openings are to be operable. Operable units are indicated on the elevations.
- See Answer to Question A.23 in **Addendum #4**, dated September 14, 2012.

A.21 Question: We need clarification on Item# 24 (Foodservice Equipment), Walk-In Dunnage Rack. The Food Service Specs calls for 17 Walk-In Dunnage Racks and the drawings are not clear enough as it is hard to decipher if there are 13 or 17 of them. Please confirm the total number of racks and how many are 36” and 48” units.

Answer: The plans reflect the following quantities and the specifications would be revised to read:

ITEM: 24

DESCRIPTION: WALK IN DUNNAGE RACK

QUANTITY: 15

MANUFACTURER: METALMASTERS

MODEL: MDR 2448-E/MDR 2436-E-HOP046

ALT MFG #1: I.S.S.

ALT MFG #2: ADVANCE TABCO

Twelve (12) 48" units, three (3) 36" units

A.22 Question: Attached find information from Dynamic Sports Construction requesting approval of their Dyna Force athletic flooring system as equal to the listed products of specification section 09660. Please advise.

Answer: Bidders may submit bids including pricing for any of the products named in the specifications, and Bidders are further advised that that competitively-priced substitutions may be given consideration after award.

A.23 Question: With reference to the door schedule in specification section #08702, there are many wood doors that are indicated with glass type GL-11 which is designated as fire rated glazing with 45 and 60 minute rating, yet this is not always the case with many of the wood doors. Will these doors actually receive fire rated glass type GL-11? If so, what minute rating will they have? Please advise.

Answer: See Answer to Question A.23 in Addendum #3, dated September 11, 2012.

A.24 Question: The operable casement windows mentioned with the specification section 08810 indicates a model designation which appears to be a captured unit, yet the details and sections show a "Zero Sightline" window unit. Please advise which type is to be selected and quoted.

Answer: See Answer to Question A.25 in Addendum #3, dated September 11, 2012.

A.25 Question: Are there any A/V design drawings or is the A/V system more of a design build? Our vendors are asking for more details than what is shown on the T drawings.

Answer: The A/V Systems shall be a design-build conforming to the performance criteria represented in the specifications and drawings.

A.26 Question: Please clarify the following questions regarding Telescopic bleachers:

- a. On each bank what is the total number of seats?
- b. Can we design the bleachers on total seat count?
- c. Do the rails as specified have to be permanent meaning no moving parts once installed or can they move and be stored in another place when closing the bleachers?
- d. 12" nominal depth for the wood seats is called for. Is 10" acceptable?
- e. The wheel chair area cutouts are in the specification. This would cause a loss of seating. Is truncation acceptable therefore maximizing the seating or should we provide no seats at the ADA areas?
- f. Aisle Lights are specified and normally are not on gym bleachers. Are they required?

- g. For the understructure, please confirm that x Bracing will be accepted and the product should be a straight framed system.
- h. What are the power requirements, i.e. 3 phase? What about first row power?
- i. Will clear coat be accepted on the decking?
- j. Both end panels and aisle closure are specified. Do you want both?

Answer: to Telescoping Bleachers questions:

- a. Provide bench type bleacher.
- b. No, provide size shown on drawings.
- c. Provide removable rails.
- d. Provide 12" seat depth.
- e. Provide wheelchair cut-outs as per documents.
- f. Provide aisle lights as specified.
- g. Confirmed, per specifications.
- h. Confirm power requirements with specific manufacturer. No first row power.
- i. Yes.
- j. Yes.

A.27 Question: Please clarify the following questions regarding athletic equipment:

- a. The plans in the gym appear to have 6 ceiling suspended basketball backstop/systems. The specifications call for both ceiling and wall mounted ones. Are any of these hoops wall mounted?
- b. Are safety straps required?
- c. What type of edge pads, if any, are required?
- d. What type of rim is specified?
- e. What type and size of backboard is specified?
- f. The model of basketball backstop specified is sidefold. Are all 6 basketball backstops to be sidefold?

Answer: to Athletic Equipment questions:

- a. All backstops are ceiling mounted.
- b. Yes.
- c. Yes, Draper #503253 2" Wide Safe-edge Padding, or approved equal.
- d. Provide rim Draper #503576 Breakaway Basketball Goal, or approved equal.
- e. Provide backboard Draper # 503136 Rectangular Glass 72" x 42" Basketball Backboard, or approved equal.
- f. Yes, although the four side court backstops to be height adjustable.

A.28 Question: Who is to provide the dishwashers and refrigerators at the Science Prep Rooms? They are not noted as NIC. If GC is to furnish, please provide specifications with manufacturers and model numbers.

Answer: See Attachment #13 of this Addendum #5 (Revised Specification Section 12350 – Laboratory Casework, dated September 12, 2012 – Issued for Addendum #5).

A.29 Question: There is no specification for any of the Science Casework plumbing fixtures, sinks, drains, fittings, etc... Please provide specification.

Answer: See Attachment #13 of this Addendum #5 (Revised Specification Section 12350 – Laboratory Casework, dated September 12, 2012 – Issued for Addendum #5).

A.30 Question: There is no specification for the accessible safety center equipment (i.e. sinks, eye wash station). See 10/A-604 for typical elevation. Please provide specification.

Answer: See Attachment #13 of this Addendum #5 (Revised Specification Section 12350 – Laboratory Casework, dated September 12, 2012 – Issued for Addendum #5).

A.31 Question: At the Science Classroom Drawings, there are no details for the teacher’s demonstration desk. Please provide.

Answer: See Attachment #13 of this Addendum #5 (Revised Specification Section 12350 – Laboratory Casework, dated September 12, 2012 – Issued for Addendum #5).

A.32 Question: The size for the fume hood is not shown. The specifications only indicate 35” x 79” door opening. Please provide manufacturer, model number, size and details for the fume hood.

Answer: See Attachment #13 of this Addendum #5 (Revised Specification Section 12350 – Laboratory Casework, dated September 12, 2012 – Issued for Addendum #5).

A.33 Question: Drawing G-003 – Note refers to ‘CK01 finish on full wall surface. Refer to specification section 06400. Section 06400 does not have any reference to ‘CK01’ finish. What is ‘CK01’ finish? Please provide specification data.

Answer: See section 06400-2.7.C.1 Cork Covering.

A.34 Question: Drawing A-1023A @ Chemical Storage 352 has a Note #2 indicating ‘Laboratory Casework – Details 19/A-603’. Please confirm that casework goes in this room and provide floor plan and elevations for the casework at this room..

Answer: Provide cabinets to fit as per elevation 19A/A-603.

A.35 Question: Drawing A-1023A @ Chemical Storage 3521 – there is no Note #2. Is there any casework for this room? If so, please provide floor plan and elevations for the casework at this room.

Answer: Provide cabinets to fit as per elevation 19A/A-603.

A.36 Question: Specification section 06400 and Drawing A-753, Details for Countertops – Please confirm that all countertops are plastic laminate as specified in specification section 06400 and not epoxy resin as shown on Details 1/A-753, 3/A-753, 7/A-753 & 12/A-753.

Answer: All countertops not in the Science rooms or related to Food Service are to be plastic laminate.

A.37 Question: Are all counters in the Science Rooms to be black epoxy resin?

Answer: All counters in the Science Rooms to be black epoxy resin.

A.38 Question: Please confirm that all photography equipment indicated in specification section 11470 is part of the GC bid and not part of FFE Equipment.

Answer: Yes, per specs. This specification section has been revised. See Attachment #4 of this Addendum #5 (Revised Specification Section 11470 – Photography Equipment, dated September 12, 2012 – Issued for Addendum #5).

A.39 Question: Specification section 09400 (Terrazzo) is included and referenced on the finish schedule on Drawing G-003. This finish cannot be located on the drawings. Please confirm if there is poured any epoxy terrazzo flooring on this project and if so, where.

Answer: Terrazzo flooring has been deleted from the project. The spec section 09400 is to be removed in its entirety.

A.40 Question: Specification Section 10270 – Access Flooring is included with the bid documents. This item cannot be found on the drawings. Please clarify if Access Flooring is required, and if so, where.

Answer: Access flooring has been deleted from the project. The spec section 102700 is to be removed in its entirety.

A.41 Question: The gym floor plans indicate 6 ceiling suspended basketball backstop/systems. The specifications call for both ceiling and wall mounted ones. Which are ceiling mounted and which are wall mounted?

Answer: All backstops are ceiling mounted.

A.42 Question: The model of basketball backstop specified is sidefold do you want all 6 basketball backstops to be sidefold? TBS-26-B.

Answer: Yes, although the four side court backstops to be height adjustable.

A.43 Question: Are safety straps for the basketball backstop/systems to be provided?

Answer: Yes.

A.44 Question: Are edge pads for the basketball backboards to be provided?

Answer: Yes, Draper #503253 2” Wide Safe-edge Padding, or approved equal.

A.45 Question: What type of basketball rim is to be provided?

Answer: Provide rim Draper #503576 Breakaway Basketball Goal or approved equal.

A.46 Question: What type and size of backboard is to be provided?

Answer: Provide backboard Draper # 503136 Rectangular Glass 72" x 42" Basketball Backboard, or approved equal.

A.47 Question: The scoreboard is manufactured in Canada is this acceptable?

Answer: Hamilton Digital designs was the basis of design, however project must meet state codes 52:32-1 and 52:31-1.

A.48 Question: Gym Divider: Two companies certify Greenguard, Porter and Draper will these have preference based upon the Green building specifications?

Answer: No preference based on Greenguard as long as products meet all spec requirements.

A.49 Question: In regards to Specification Section 12660 – Telescoping Stands, please clarify the following:

- On each bank what is the total number of seats you want?
- Can the bleachers be design based on total seat count?
- Do the rails as specified have to be permanent (i.e. no moving parts once installed) or can they move and be stored in another place when closing the bleachers?
- 12” depth for the wood seats is shown. Is 10” acceptable?
- On the nose beam, 14 gauge steel is indicated. All but one manufacturer uses 13 gauge as it is heavier and stronger thus supporting the seats and decking. Is 14 gauge acceptable?
- Wheel chair area cutouts are called for in the specification. This will result in a loss of seating. Is truncation acceptable therefore maximizing the seating or should we provide no seats at these ADA accessible areas?
- Aisle Lights are specified but are typically not provided on gym bleachers. Please clarify.
- Please confirm that x Bracing will not be accepted and the product should be a straight framed system.
- What are the power requirements (i.e. 3 phase)?
- Does the first row require power?
- Will clear coat be accepted on the decking as specified?
- End panels and aisle closure are both specified. Do you want both? Please advise.

Answer: The following are answered in same order as bulleted questions for Telescoping Stands:

- Provide bench type bleacher.
- No, provide size shown on drawings.
- Provide removable rails.
- Provide 12” seat depth.
- 13 gauge is acceptable.
- Provide wheelchair cut-outs as per documents.
- Provide aisle lights as specified.
- Confirmed, per specifications.
- Confirm power requirements with specific manufacturer.
- No.
- Yes.
- Yes.

A.50 Question: Please provide window type marks for all the windows at the Third and Fourth Floors. Also, please provide window widths, heights, etc... These windows are not listed in the window schedule. There are single, double and triple windows with no dimensions.

Answer: As noted on the elevations, the windows within the metal panel system are to fit within the metal panel module as of panel type A. Full height glazed units to follow spec section 08900 Aluminum & Glass Curtain wall.

A.51 Question: Please confirm that the ceiling at Toilets 186 & 193 have exposed construction 'E' as indicated and not 'G' gypsum board ceilings as the rest of the toilet rooms.

Answer: Yes - 'E' construction as indicated.

A.52 Question: Drawing 12/A-753 (Auditorium Sound Booth Counter) does not appear on the floor plans. Where is the Auditorium Sound Booth Counter booth located and what is the length of the counter? Please provide a plan.

Answer: See CONTROL BALCONY on 2/A-308.

A.53 Question: Specification 17300 B.I specifies that a Cisco survivable remote site telephone (SRST) router is to be installed at the new site remote from the districts existing Cisco unified communications manager. No wiring is indicated or specified from the MDF to the street or to the existing location to accomplish this interface. Please provide the wiring interconnections, if required, for the new remote (SRST) to be able to communicate with the existing Cisco unified communications manager.

Answer: The connectivity to the street (existing District WAN) is provided by the Owner's Service Provider and is the responsibility of the Owner.

A.54 Question: Also, please identify the existing location of the Cisco unified communication manger.

Answer: The location of the Cisco unified communication manger is to be obtained from the District.

A.55 Question: P101A, P-101B: Acid Vent is Not shown from Acid Waste Tanks. AWT/1 & AWT/2.

Answer: See revised plumbing plans and riser diagrams for vent routing. See Attachments #14 and #15 of this Addendum #5 (Revised Drawings P-101A – Plumbing Ground Floor Plan – Part A and P-101B – Plumbing Ground Floor Plan – Part B, both dated September 17, 2012 – Issued for Addendum #5).

A.56 Question: P-001: Note #22 - Can we use Polypropylene w/ Fusion Joints (NON-PVDF Pipe & Fittings) from floor to lab sinks and floor to ceiling?

Answer: Polypropylene piping w/fusion joints is acceptable to be used for acid waste in all areas except plenum ceilings. PVDF piping must be used in all plenum ceilings.

A.57 Question: P-102B: Need a piping detail in mechanical room #204 KDDE.

Answer: See revised drawings showing piping diagrams for plumbing in Mechanical Room. See Attachment #17 of this Addendum #5 (Revised Drawing P-102B – Plumbing Second Floor Plan – Part B, dated September 17, 2012 – Issued for Addendum #5).

A.58 Question: There is a lot of acid waste piping missing on the plans for acid waste stack #3 for room 348, #6 for rooms 333 & 334, and #4 for room 4447. Please clarify or provide revised drawings.

Answer: See revised plans and riser diagrams for acid waste piping clarifications. See Attachments #18 and #19 of this Addendum #5 (Revised Drawings P-103A – Plumbing Third Floor Plan – Part A and P-103B – Plumbing Third Floor Plan – Part B, both dated September 17, 2012 – Issued for Addendum #5).

A.59 Question: P-101A does not show any underground piping for storm risers 24 or 25. Please clarify se or revise drawing.

Answer: See revised drawings showing routing of storm risers 24 and 25. See Attachment #14 of this Addendum #5 (Revised Drawing P-101A Plumbing Ground Floor Plan – Part A, dated September 17, 2012 – Issued for Addendum #5).

A.60 Question: Please show the riser for #24 on P-102A and P-103A.

Answer: See revised riser diagram for riser #24. See Attachments #16 and #18 of this Addendum #5 (Revised Drawings P-102A - Plumbing Second Floor Plan – Part A and P-103A – Plumbing Third Floor Plan – Part A, both dated September 17, 2012 – Issued for Addendum #5).

A.61 Question: Please show underground and above ground piping for storm riser #16:

Answer: See revised plumbing plans for routing of riser #16. See Attachment #20 of this Addendum #5 (Revised Drawing P-205 – Plumbing Storm Riser Diagram, dated September 17, 2012 – Issued for Addendum #5) and Attachment #21 of this Addendum #5 (Sketches CSK-P-101A-1 through CSK-P-104A-2).

A.62 Question: Drawing P101A, P101B, P102A and P102B have no piping sizes shown. Please provide.

Answer: See riser diagrams for piping sizes. Plans and risers have been updated. See Attachments #14, #15, #16 and #17, all dated September 17, 2012, issued for this Addendum #5

A.63 Question: Please provide a riser diagram for water piping.

Answer: See revised water riser diagrams. See Attachment #22, Revised Drawing P-203 – Plumbing Domestic Water Diagram, dated September 17, 2012, issued for Addendum #5

A.64 Question: Below are questions from one of our vendors pertaining to the stage lighting and controls: We have run into the following questions. Basically, it looks like a drawing for one job and a specification for another. As a result, almost nothing matches. These are the differences we noticed so far:

- a. The dimming system in drawing EL-106. Detail 3 does not match what is specified in specification section 16570. Drawing shows Strand dimming while specification calls out ETC.
- b. Likewise, the lighting fixtures specified on the bill of materials on drawing EL-106 differs from the written specification.
- c. The dimmer plug boxes listed on the BOM on drawing EL-106 are not specifically shown on the EL-105 detail 1 drawing.
- d. The form lighting connector strip on drawing EL-105 detail 2 is not specified on the bill of materials or in the written specifications.
- e. The riser on drawing EL-106 detail 3 calls out an ELTS but it is not described in the written specifications.
- f. The bill of materials in specification section 2.21 does not match what is drawing on drawings EL-105 and EL-106.
- g. The written specification calls out (multiple times) the requirement for dimmer doubling. The system on drawing EL-106 is not capable of fulfilling this requirement.

Answer: See revised Specification Section 16750 for answers. See Attachment #12 of this Addendum #5 (Revised Specification Section 16770 – Dimming Control, dated September 13, 2012 – Issued for Addendum #5).

A.65 Question: On the Elizabeth Academic High School bid there is a reference on page 487 that clearly states this contract will adhere to the state codes 52:32-1 and 52:31-1 which states because the job is 100% funded by state funds the products going into the project have to be American made 100%. Not 50% with the steel being 100% Made in the U.S.A. if federal funds were used. That said Can you please ask the New Jersey Schools Development Authority/Architect if they are accepting the following products which are in the specification in section 12620- Fixed Auditorium Seating even know they are not U.S.A. manufactured? I have included both the page (487) and Specification along with Hussey's Fusion Data sheet which clearly states it's made in China.

1. Hussey Seating Company's Fusion made in china
2. Booth Seating Company The Roma Seat which is actually made by a company call <http://mobiliarioseating.com/> Both does not manufacture the chair as is a manufacturers rep for Mobiliario.

Besides the Irwin chair which is manufactured in the U.S.A. there are other seating companies which there products are 100% made in the U.S.A.

Please advise if we can give you pricing on either the Hussey or Booth chair which are made in the U.S.A.

Answer: Bidders may submit bids including pricing for any of the products named in the specifications, and Bidders are further advised that competitively-priced substitutions may be given consideration after award.

A.66 Question: Attached find information regarding auditorium seating. Please review and advise if the specified seats manufactured by Hussey and Booth are acceptable in light of the location of manufacture.

Answer:

Bidders may submit bids including pricing for any of the products named in the specifications, and Bidders are further advised that competitively-priced substitutions may be given consideration after award.

A.67 Question: On page GC-109 of the Project Specifications, it clearly states this contract will adhere to the state codes 52:32-1 and 52:31-1 which states because the job is 100% funded by state funds, the products going into the project have to be 100% American made.. Will the New Jersey Schools Development Authority/Architect accept the following products which are in the specification in section 1260- Fixed Auditorium Seating even know they are not U.S.A. manufactured?.

a. Hussey Seating Company's Fusion is made in China. Attached is the Hussey's Fusion Data sheet which clearly states it's made in China .

b. Booth Seating Company: The Roma Seat which is actually made by a company called <http://mobiliarioseating.com/> Booth does not manufacture the chair and is a manufacturer's rep for Mobiliario

Besides the Irwin chair which is manufactured in the U.S.A. are there other seating companies which there products are 100% made in the U.S.A.

Answer: Bidders may submit bids including pricing for any of the products named in the specifications, and Bidders are further advised that competitively-priced substitutions may be given consideration after award.

B ADDENDUM TO SPECIFICATIONS AND DRAWINGS

B.1 Specification Section 03450 – Precast Concrete

In Volume 2 of 3 of the Project Manual, insert the following Specification Section after Section 03360 – Special Concrete Floor Finishes, dated July 13, 2012 Issued for Bid with:
Attachment #1 – Section 03450 – Precast Concrete, dated September 12, 2012 – Issued for Addendum #5

B.2 Specification Section 08910 – Aluminum Windows

In Volume 2 of 3 of the Project Manual, replace Section 08910 – Aluminum Windows, dated July 13, 2012 Issued for Bid with:

Attachment #2 – Section 08910 – Aluminum Windows, dated September 12, 2012 – Issued for Addendum #5

B.3 Specification Section 09510 – Acoustical Ceilings

In Volume 2 of 3 of the Project Manual, replace Section 09510 – Acoustical Ceilings, dated July 13, 2012 Issued for Bid with:

Attachment #3 – Section 09510 – Acoustical Ceilings, dated September 12, 2012 – Issued for Addendum #5

B.4 Specification Section 11470 – Photography Equipment

In Volume 2 of 3 of the Project Manual, replace Section 11470 – Photography Equipment, dated July 13, 2012 Issued for Bid with:

Attachment #4 – Section 11470 – Photography Equipment, dated September 12, 2012 – Issued for Addendum #5

B.5 Luminaire Schedule

Luminaire Schedule is revised as per:

Attachment #5 – Sketch SKE-001 (revised Luminaire Schedule, dated 9-5-12).

B.6 Drawing A-301

Revised Drawing A-301:

Attachment #6 – Revised Drawing A-301 (Stair #5 & #7 Plans & Sections), dated 9-12-12, issued for Addendum #5.

B.7 Drawing A-302

Revised Drawing A-302:

Attachment #7 – Revised Drawing A-302 (Stair #6 Plans & Sections), dated 9-12-12, issued for Addendum #5.

B.8 Drawing A-304

Revised Drawing A-304:

Attachment #8 – Revised Drawing A-304 (Stair #1 Plans & Sections), dated 9-12-12, issued for Addendum #5.

B.9 Drawing A-305

Revised Drawing A-305:

Attachment #9 – Revised Drawing A-305 (Stair #1 Plans & Sections), dated 9-12-12, issued for Addendum #5.

B.10 Drawing A-306

Revised Drawing A-306:

Attachment #10 – Revised Drawing A-306 (Stair #3 Plans & Sections), dated 9-12-12, issued for Addendum #5.

B.11 Drawing A-307

Revised Drawing A-307:

Attachment #11 – Revised Drawing A-307 (Stair 4 Plans & Sections), dated 9-12-12, issued for Addendum #5.

B.12 Specification Section 16570 – Dimming Control

In Volume 3 of 3 of the Project Manual, replace Section 16570 – Dimming Control, dated July 13, 2012 Issued for Bid with:

Attachment #12 – Section 16570 – Dimming Control, dated September 13, 2012 – Issued for Addendum #5.

B.13 Specification Section 12350 – Laboratory Casework

In Volume 3 of 3 of the Project Manual, replace Section 12350 – Laboratory Casework, dated July 13, 2012 Issued for Bid with:

Attachment #13 – Section 12350 – Laboratory casework, dated September 12, 2012 – Issued for Addendum #5.

B.14 Drawing P-101A

Revised Drawing P-101A:

Attachment #14 – Revised Drawing P-101A (Plumbing Ground Floor Plan – Part A), dated 9-17-12, issued for Addendum #5.

B.15 Drawing P-101B

Revised Drawing P-101B:

Attachment #15 – Revised Drawing P-101B (Plumbing Ground Floor Plan – Part B), dated 9-17-12, issued for Addendum #5.

B.16 Drawing P-102A

Revised Drawing P-102A:

Attachment #16 – Revised Drawing P-102A (Plumbing Second Floor Plan – Part A), dated 9-17-12, issued for Addendum #5.

B.17 Drawing P-102B

Revised Drawing P-102B:

Attachment #17 – Revised Drawing P-102B (Plumbing Second Floor Plan – Part B), dated 9-17-12, issued for Addendum #5.

B.18 Drawing P-103A

Revised Drawing P-103A:

Attachment #18 – Revised Drawing P-103A (Plumbing Third Floor Plan – Part A), dated 9-17-12, issued for Addendum #5.

B.19 Drawing P-103B

Revised Drawing P-103B:

Attachment #19 – Revised Drawing P-103B (Plumbing Third Floor Plan – Part B), dated 9-17-12, issued for Addendum #5.

A.20 Drawing P-205

Revised Drawing P-205:

Attachment #20 – Revised Drawing P-205 (Plumbing Ground Storm Riser Plan), dated 9-17-12, issued for Addendum #5.

A.21 Sketches CSK-P-101A-1 through CSK-P-104A-2

Attachment #21 - Sketches CSK-P-101A-1 through CSK-P-104A-2, Concord Engineering.

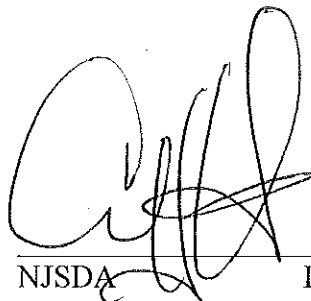
A.22 Drawing P-203

Revised Drawing P-203:

Attachment #22 – Revised Drawing P-203 (Plumbing Domestic Water Riser Diagram), dated 9-17-12, issued for Addendum #5.

End of Addendum No. #5

Any bidder attempting to contact government officials (elected or appointed), including NJSDA Board members, NJSDA Staff, and Selection Committee members in an effort to influence the selection process may be immediately disqualified.


NJSDA _____ Date 9.17.12
Carl Valenti

<Addendum #5>

NJSDA
1 West State Street
Trenton, NJ 08625
Phone: 609-292-8775
Fax: 609-656-4642

Date: September 17, 2012

PROJECT #: EL-0006-C01

DESCRIPTION: Elizabeth Academic High School

Addendum No. 5

Acknowledgement of Receipt of Addendum

Contractor must acknowledge the receipt of the Addendum by signing in the space provided below and returning via fax to 609-656-4642, or in an attachment via E-mail to djohnson@njsda.gov. Signed acknowledgement must be received prior to the Technical Proposal and Price Proposal Due Date. Acknowledgement of the Addendum must also be made in the Technical Proposal Submission.

Signature

Print Name

Company Name

Date



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #1 – Specification Section 03450 –
Precast Concrete

9/17/12

SECTION 03450 – PRECAST CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. General: Provide precast concrete work as shown on the drawings or inferred from and/or as specified in accordance with the requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
 - 1. Embedded steel connections in concrete is specified in Section 03300 "Cast-In-Place Concrete".
 - 2. Masonry units as specified in Section 04200 "Masonry Units".
 - 3. Steel Connections to Steel Framing is specified in Section 05120 "Structural Steel".
 - 4. Sealants and joint fillers are specified in Section 07920 "Joint Sealants".
 - 5. Precast concrete roof ballast as specified in Section 07565 "Fluid Applied Protected Membrane Roofing".
 - 6. Section 01115 "Sustainable Design and Construction."
 - 7. Section 01440 "Construction Indoor Air Quality Management."
 - 8. Section 01505 "Construction Waste Management."
 - 9. Section 01525 "Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints & Coatings."

1.2 REFERENCES

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
 - 1. American Concrete Institute (ACI)
 - a. ACI 301: "Specifications for Structural Concrete for Buildings".
 - b. ACI 318: "Building Code Requirements for Reinforced Concrete".
 - c. ACI 315: "Details and Detailing of Concrete Reinforcement".
 - d. ACI 211.1: "Standard Practice for Selecting Proportions for Normal and Heavy Weight Concrete".

SECTION 03450 – PRECAST CONCRETE

- e. ACI 211.2: "Standard Practice for Selecting Proportions for Structural Lightweight Concrete".
 - f. ACI 304: "Guide for Measuring, Mixing, Transporting and Placing Concrete".
 - g. ACI 347 "Guide to Formwork for Concrete".
2. American Welding Society (AWS)
- a. AWS D1.1: "Structural Welding Code - Steel".
 - b. AWS D1.4: "Structural Welding Code - Reinforcing Steel".
3. Precast/Prestressed Concrete Institute
- a. PCI MNL 117: "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products".
 - b. PCI MNL 121: "Manual for Structural Design of Architectural Precast Concrete".
 - c. PCI MNL 123: "Design and Typical Details of Connections for Precast and Prestressed Concrete".
 - d. PCI MNL 127: "Recommended Practice for the Erection of Precast Concrete".
4. Concrete Reinforcing Steel Institute (CRSI)
- a. CRSI: "Manual of Standard Practice
 - b. CRSI-WCRSI "Placing Reinforcing Bars".

1.3 SYSTEM DESCRIPTION

A. Design Requirements

- 1. Detailing: The method of erecting, installing and anchoring of precast concrete indicated on the drawings is diagrammatic only and shall be used for the purposes of bidding. Contractor shall be responsible for design and warranty the structural support, the permanent anchorage and the integrity of precast concrete Work. Alternate methods of detailing, proposed by the Contractor, will be considered provided it complies with aesthetic design shown and performance criteria specified. Design the installation to allow for expansion, contraction and differential deflection.
- 2. The Work of this Section includes, but is not limited to the following
 - a. Design, fabrication and installation of precast assemblies including

SECTION 03450 – PRECAST CONCRETE

embedment plates, connections to building structural framing, panel reinforcement, support and anchorage to building structure.

- b. Engineered steel support systems and anchorages are those required for the exclusive support and anchorage of the precast assemblies and are other than the building primary framing.

3. Design Drawings: The Architect's drawings indicate the design concept, the overall size, profile and location of precast concrete wall components and, together with the specified "Performance Criteria", tolerances, materials, finishes and standards, impose the requirements to be conformed to by the Bidder's proposed precast concrete system.

B. Performance Criteria

1. Gravity Loads: Design, fabricate and install precast concrete units so as to support its own weight as well as the weight of elements supported by precast concrete units.
2. Design, fabricate and install precast concrete units to provide for expansion and contraction over an ambient temperature range of 120 deg. F. and a surface temperature range of 180 deg. F. without causing undue stress on precast units, supports or anchors, sealed joint failure or other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
3. The connection system as shown is suggested for the precast installation. Final connection design is the sole responsibility of the Contractor. Coordinate the location of connectors to be cast in precast concrete with connectors to the structure.
4. Deflections: Calculations for deflections shall be based upon the combination of maximum direct loadings, building deflections, thermal stresses, and erection tolerances and the following.
 - a. Design, fabricate and install assemblies, including anchorage, for deflections not to exceed 1/500 times span or 1/4 in. (whichever is less) perpendicular to the slab edge at full design loading. Span is defined as the distance between anchor centerlines; for cantilevers, span is defined as the distance between anchor centerline and the end of the cantilever.
 - b. Design, fabricate and install assemblies, including anchorage, for deflections not to exceed 1/1000 times span or 1/8 in. (whichever is less) parallel to the slab edge at full design loading. Span is defined as the distance between anchor centerlines; for cantilevers, span is defined as the distance between anchor centerline and the end of the cantilever.
 - c. Permanent deformation, weld or fastener failure, component disengagement or breakage shall not occur under loading equal to 1.5 times the design load pressures (positive and negative) specified herein. Permanent deformation is defined as deflection without recovery exceeding length/1000.

SECTION 03450 – PRECAST CONCRETE

- d. Restrict deflection of precast concrete members to smaller values where member flexibility would result in overstressing of stone veneer.
5. Design Modifications: Make design modifications of work shown only as may be necessary to meet performance requirements and coordinate the work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Architect for review. Maintain the general design concept without altering profiles, alignments and loads imposed on building structure shown.

1.2 SUBMITTALS

- A. Product Data: Submit for Architect's action. Submit manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
 1. Furnish information for each type of cement, aggregate, admixture, curing and finishing material.
 2. Form Release Agent: Furnish data stating that the product will not stain the concrete surfaces and will not adversely affect the bond of subsequently applied finishes.
- B. Shop Drawings: Submit for Architect's action. Submit shop drawings for the fabrication and installation of the Work. Prepare details at not less than 3 in. = 1 ft. minimum scale indicating profiles, cross-sections, dimensions, joints and arrangement of units; details of units, anchors, inserts, penetrations and openings, connections to adjoining work or materials, reinforcing for each unit, fabrication tolerances, estimated cambers if applicable, method of installation and anchoring and lifting devices necessary for handling and erection, as well as the following:
 1. Details of each type of required connections.
 2. Indicate materials utilized for sealing formwork joints and as a form release agent for coordination of subsequent coverings.
 3. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories. Indicate locations and details of anchorage devices to be embedded in other construction.
 4. Clearly indicate protective finishes for metal items including connectors.
 5. Number each precast unit clearly on an unexposed surface to correspond with identity numbers on erection drawings.
 6. Include complete engineering data for fabrication, reinforcement and anchorage, bearing the seal of a licensed Professional Engineer registered in the State of New Jersey.
- C. Setting Drawings: Submit for Architect's information. Submit setting drawings and templates for the location of anchorage items that are to be embedded in or anchored to concrete or

SECTION 03450 – PRECAST CONCRETE

masonry.

- D. Calculations: Submit for Architect's information. Prepare complete design calculations, including loads imposed on structure, prepared, signed and sealed by a Professional Engineer registered in the State of New Jersey. Submittals of calculations for permanent parts of the structure will be reviewed only for compliance with stipulated design criteria.
1. Submit structural calculations for connections and panels. Submit engineering calculations to show that maximum deflections do not exceed specified performance requirements under full design loading.
 2. Submit calculations of expansion and contraction.
- E. Green Building Submittal Requirements
1. A completed GREEN BUILDING MATERIALS CERTIFICATION FORM (GBMCF), appended to Section 01115: "Sustainable Design and Construction". Information to be supplied for this form shall include:
 - a. Cost breakdowns for the materials included in the Contractor or sub-contractor's work. Cost breakdowns shall include total cost plus itemized material costs for the precast concrete systems and associated products.
 - b. The manufacturing location and raw material sources of the precast concrete and associated products.
 - c. The amount of post-consumer and/or post industrial recycled content in the precast concrete systems.
 - d. The VOC content of all interior and field-applied adhesives, sealants, paints, and coatings.
 2. GBMCF Back-Up Documentation: These documents are used to validate the information provided on the GBMCF (except cost data). For each material listed on the GBMCF, provide documentation to certify the material's GREEN BUILDING attributes, as applicable:
 - a. Recycled content: Provide published product literature or letter of certification on the manufacturer's letterhead certifying the amounts of post-consumer and/or post-industrial content.
 - b. Regional manufacturing (within 500 miles): Provide published product literature or letter of certification on the manufacturer's letterhead indicating the city/state where the manufacturing plant is located and the distance in miles from the project site.
 - c. Regional raw materials (within 500 miles): Provide published product literature or letter of certification on the manufacturer's letterhead indicating the city/state from which each of the raw materials in the product were

SECTION 03450 – PRECAST CONCRETE

extracted, harvested or recovered, and the distance in miles from the project site. If only some of the raw materials for a particular product or assembly originate within 500 miles of the project site, provide the percentage (by weight) that these materials comprise in the complete product.

- d. Product cut sheets for materials that meet the GREEN BUILDING Materials Certification Form. Cut sheets shall be submitted with the Contractor or sub-contractor's stamp, as confirmation that the submitted products are the products installed in the Project
 - e. Material Safety Data Sheets (MSDS), for applicable products. Applicable products include, but are not limited to field-applied adhesives, sealants, carpets, paints and coatings used on the interior of the building. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
3. The GREEN BUILDING submittal information shall be assembled into one (1) package per Section or trade, and sent to the Consultant of review. Incomplete or inaccurate GREEN BUILDING submittals may be used as the basis for rejecting the submitted products or assemblies.
- F. Quality Control Submittals: Submit for Architect's information.
- 1. Certificates
 - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Fabricator/Erector certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
 - b. Mill Certificates: Copies of manufacturer's certificates of mill tests of cement, reinforcing steel, structural steel and embedments.
 - c. Certification: Certification that precast units conform with sizes and dimensions shown on shop drawings, within the specified fabrication tolerances. Submit certification that erection of units is within the tolerances specified.
 - d. Admixture Certificates: Submit from each admixture manufacturer certification as to the appropriateness of the use of their admixture(s) in the combination, dosages, batching and construction procedures proposed.
 - e. Statements of Qualification: Submit the following:

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- 1) Prior to award of Contract, submit the fabricator's and the erector's experience resume.
 - 2) Submit copies of prequalification of welders and other welding procedures in forms as prescribed in AWS "Structural Welding Code".
- f. Erection Procedures: Prior to starting Work, submit detailed outline of sequence and methods of erection for precast concrete units including accessories and embedded items. In addition, submit for review, testing and inspection reports required under Paragraph "Quality Control".

1.3 QUALITY ASSURANCE

- A. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Contractor to choose. An alternative material, product or process will be considered if the Contractor submits a written substitution request together with such information as may be necessary to assist the Architect in determining whether the proposed substitution is acceptable; the burden of proof rests solely upon the Contractor.
- B. Qualified Installer: The precast concrete work shall be performed by a firm having 5 years experience in the installation of specified materials on comparable projects. The firm shall have the approval of the precast concrete materials manufacturer. The Installer shall provide evidence of successful completion of work of similar scope to that shown and specified for this Project using similar precast concrete systems.
- C. Sole Source Responsibility: Obtain precast concrete from one source of a single fabricator/manufacturer. Obtain accessory products used in conjunction with precast concrete from the precast concrete manufacturer or from sources acceptable to the precast concrete fabricator/manufacturer. The fabricator/manufacturer shall furnish evidence that the specified materials have been fabricated/manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
1. This firm shall be a producer member of the Precast/Prestressed Concrete Institute (PCI) and/or shall participate in its Plant Certification Program.
- D. Pre-Installation Meeting: Prior to the start of the Work, meet at the Project site to review methods and sequence of precast concrete installation, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Transport, store and handle precast units in a manner to avoid undue strains, hair cracks, staining, or other damage. Units shall be supported on proper dunnage, with edges blocked or otherwise protected. Strapping, hauls or chains shall be protected from direct contact with precast units.

SECTION 03450 – PRECAST CONCRETE

1. Sequencing: Deliver in accordance with schedule and proper setting sequence.
 2. Identification Marking: When delivered, each precast member shall bear a number clearly imprinted on an unexposed surface to correspond with an identification piece mark. Piece mark shall include date of casting. Correlate piece marks with test reports and shop drawings.
 3. Lifting: Lift and support precast concrete units only at designated lifting or supporting points shown on final shop drawings. Handle units with devices which will not scar or otherwise deface the surfaces of units.
- B. Storage and Protection: Store precast units free of the ground and protected from mud or rain splashes adequately supported at blocking points and with identification marks visible. Cover units, secure covers firmly, and protect the units from dust, dirt or other staining materials

1.5 PROJECT/SITE CONDITIONS

- A. Frozen Work: Do not set which have a film of frozen water or frost. Remove and replace, as directed, precast work which is observed to be damaged in any way by freezing or frost.

PART 2 - PRODUCTS

2.1 FORMWORK MATERIALS

- A. Precast Concrete Formwork
1. General: Comply with ACI 347, “Recommended Practice for Concrete Formwork”, as required to consistently maintain dimensional and surface finish controls specified for tolerances.
 2. Precast Concrete Formwork: Construct forms of non-staining metal, fiberglass reinforced polyester, concrete, or other acceptable materials. Fabricate and reinforce for close control of dimensions and details. Make forms sufficiently rigid so that precast units will meet the casting tolerances. Construct forms tightly to prevent leakage of mortar or paste. Form joints will not be permitted on faces exposed to view in the finished work.
 3. Form Release Agent: Non-staining, rust preventative coating which will not adversely affect the bond of subsequent surface coatings to concrete or applied veneers.

2.2 CONCRETE REINFORCING AND METAL ACCESSORIES

- A. Reinforcing Bars: ASTM A615, grade as selected by fabricator. When concrete cover, measured from matrix, on exterior surfaces is less than 1-1/2 in. or on interior surfaces is less than 3/4 in., zinc coat bars in accordance with ASTM A767. Galvanized components shall receive a chromate wash.

SECTION 03450 – PRECAST CONCRETE

1. Reinforcing adjacent to the exposed surface of panels is to be positioned and firmly held in place by hangers, or other means without the use of form-contact bar supports.
 2. Provide galvanized reinforcing bars where shown, complying with ASTM A767, Class II, 2 oz./ft.³ zinc, hot-dip galvanized. Minimum concrete cover for galvanized reinforcing bars shall be 2 in.
- B. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing.
- C. Welded Wire Reinforcement: ASTM A185, or ASTM A497; hot dipped galvanized in accordance with ASTM A123. Galvanized articles shall receive a chromate wash.
- D. Metal Accessories: Anchors, dowels, cramps, inserts, clip angles, anchor plates, shims, washers, setting loops, lifting hook inserts, and other fastening devices and accessories shall be steel, hot dipped zinc coated in accordance with ASTM A123. Fastening devices, located at inside face of assemblies and welded during erection shall be steel, prime painted as specified herein. Accessories with threaded portions shall be zinc or cadmium electroplated. Provide the following:
1. Structural Steel Shapes: ASTM A36.
 2. Steel Plates: ASTM A283, Grade C.
 3. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM A47 or cast steel ASTM A27. Provide bolts, washers and shims as required, hot dip galvanized.

2.3 CONCRETE MATERIALS

- A. General
1. Obtain cement, aggregates and water from a single source, sufficient to complete the entire work and to assure uniformity.
- B. Portland Cement: ASTM C150, Type I or Type III. The alkali content shall not exceed 0.6% unless:
1. The manufacturer certifies that no alkali reactivity is produced with the proposed combination of materials when tested in accordance with ASTM C227, or
 2. A pozzolan, proven by ASTM C441 to be effective in preventing excessive expansion due to alkali-aggregate reaction, is included in the mix.
- C. Aggregates: ASTM C33, except that weight loss shall not exceed 15% when subjected to ASTM C88 sodium sulfate soundness test.
- D. Admixtures: Calcium chloride and thiocyanates are not permitted. Provide only those admixtures which produce no detrimental effects on metal components. Admixtures, which

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when combined with other ingredients used to produce the concrete shall result in concrete having not more than the specified limits for soluble chloride ion content.

1. Each admixture manufacturer shall certify to the appropriateness of the use of their admixture(s) in the combination, dosages, batching and construction procedures proposed. Precast concrete shall contain a water reducing admixture.
 2. Air-Entraining: Comply with ASTM C260 certified by manufacturer to be compatible with other required admixtures.; providing one of the following:
 - a. "MB-VR" (Master Builders Co.).
 - b. "Daravair" (Construction Products Div., W.R. Grace & Co.).
 - c. "Sika-Aer" (Sika Corp.).
 - d. "Air-Mix" (Euclid Chemical Co.).
 3. Water Reducing (Plasticizing): Comply with ASTM C494, Type A; provide one of the following:
 - a. "WRDA with Hycol" (Construction Products Division, W.R. Grace & Co.).
 - b. "Eucon WR-75" (Euclid Chemical Co.).
 - c. "Pozzolith 322N" (Master Builders Co.).
 - d. "Plastocrete 161" (Sika Chemical Corp.).
 4. Fly Ash Admixture: ASTM C 618, Class C or F.
 5. Silica Fume Admixture: ASTM C 1240.
 6. Other Admixtures: Use only with the prior written approval of the Architect. Do not use admixtures which contain chlorides.
- E. Water: Potable, free from foreign materials in amounts that may stain or are harmful to precast concrete and embedded steel and in compliance with PCI MNL-117, Division II, Section 2.1.2.3 and ACI 301, Chapter 2, Paragraph 2.3.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Electrodes: Comply with the provisions of AWS specifications A5.1, A5.5, A5.17, A5.18, A5.20 as applicable.
- B. Grout: Free of gas producing or gas releasing agents, oxidizing catalysts, inorganic accelerators and chlorides. Comply with ASTM C1107. Cure grout in accordance with manufacturer's instructions. Provide one of the following:

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1. "Five Star Grout" (U.S. Grout Corp.).
2. "Masterflow 713 Plus" (Master Builders Co.).
3. "Euco NS" (Euclid Chemical Co.).

2.5 ENGINEERED STEEL SUPPORT SYSTEMS AND ANCHORAGES

A. General:

1. Engineered supports and anchorage for precast concrete shall be provided therewith, as defined below.
2. The support and connection systems shown are suggested, as defined below, for the precast installation. In each case the complete final design, including connections is the responsibility of the single subcontractor providing precast work and thereafter to the Contractor for acceptance and inclusion into the Project.
 - a. Support systems shall be limited to space size constraints shown by adjacent constructions.
 - b. Gravity anchors shall be provided at locations and in quantities shown, or if not shown not less than two per precast component.
 - c. Connections shall be provided generally as shown. Minimum quantities are indicated, additional connections may be included by the precast fabricator as required to facilitate maintaining precast component thickness and performance.

B. Bolts: High strength bolts, nuts and washers shall comply with the provisions of:

1. ASTM A325 and A490.
2. AISC specification for "Assembly of Structural Joints Using High Strength Bolts."

2.6 MIXES

- A. Proportioning: Provide in accordance with ACI 211.1 requirements. Produce normal weight concrete of the type and strength indicated,
- B. Adjust design mix as required to obtain the strength specified. Limit use of fly ash and silica fume to not exceed, in aggregate, 25% of Portland cement by weight.
- C. Properties of Mix
 1. Compressive Strength: 5000 psi minimum at 28 days.
 2. Slump: 3 in. maximum.

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3. Water: 5-1/2 gal. per bag of cement maximum.
4. Cement: 5-1/2 bags minimum per yd.³ of concrete.
5. Total Air Content: Not less than 4% nor more than 6%.
6. Water Absorption: Not to exceed 3% to 4% by weight or 8% to 10% by volume whichever is less.
7. Air Entraining Admixture: ACI 301, Chapter 3, Paragraph 3.4, determined by volume as per ASTM C173 or ASTM C231.

2.7 FABRICATION

- A. Forms: Construct of non-staining metal, fiberglass reinforced polyester, concrete, or other approved materials of sufficient strength to withstand pressures due to concrete-placing operations and temperature changes. Fabricate and reinforce for close control of dimensions and details. Make forms sufficiently rigid so that precast units will meet the casting tolerances. Construct forms tightly to prevent leakage of mortar or paste. Form joints will not be permitted on faces exposed to view in the finished work.
- B. Reinforcement
 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. Place welded wire and reinforcing bars of size and spacings as required to resist shrinkage, temperature and handling stresses and to achieve performance criteria, design requirements and in accordance with properly executed placement drawings. Support and space reinforcement using high density polyethylene devices to ensure that it will remain positioned in the precast units as required. Keep support devices at least 1/2 in. back from surfaces. Keep reinforcement a minimum of 3/4 in. from the edges and surfaces of the units. Assemble contiguous reinforcement as a single assembly (cage) prior to placing in forms.
 2. Tolerances: Tolerances for placement of reinforcing and other embedments shall be in accordance with PCI MNL-116.
- C. Accessories: Place inserts and other anchoring and lifting devices accurately and securely in forms. Weld accessories to the reinforcement, unless materials are not weldable, in which case secure with stainless steel tie wire. Do not place handling inserts on finished surfaces of precast units. Cast-in reglets, slots, holes, and other accessories in precast concrete units to receive dowels, reglets, flashings, and other similar work as indicated. Coordinate with other trades for installation of cast-in items.
- D. Mixing and Placing
 1. Mix concrete to distribute aggregate evenly throughout. Place concrete so as to prevent segregation in the forms.
 2. Place concrete in a continuous operation to prevent seams or planes of weakness from

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developing in precast units. Comply with requirements of MNL-117 for measuring, mixing, transporting, and placing concrete.

3. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with MNL-117.
 4. Where casting corner units, units with transitions which are less than 90 degree angle transitions and large irregular shaped units, take special care in casting and handling as required to achieve uniformity and quality control. Provide forms which allow for casting of shapes with slightly eased edges, unless otherwise shown or specified.
- E. Curing: Cure by approved artificial means until concrete has achieved at least 70% of its design strength in compliance to the requirements of MNL-117.
- F. Dimensions shown on Drawings are based on an assumed design temperature of 70 deg. F.. Fabrication and erection procedures shall take into account the ambient temperature range at the time of respective operations.
- G. Shop Painting Steel Support Systems
1. Shop paint steel support system and other ferrous metals, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, unless otherwise specified.
 2. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to additional surface preparation specified.
 3. Clean and prepare metal surfaces before applying shop coat. Remove rust and mill scale in accordance with SSPC SP-3 "Power Tool Cleaning".
 4. Immediately after surface preparation, apply primer in accordance with manufacturer's instructions. Use painting methods which will result in full coverage and dry film thickness specified.
 5. Apply one shop coat of primer to steel support systems, except apply 2 coats of primer to surfaces inaccessible after assembly or erection. Change color of second or finish coat to distinguish it from the first coat.

2.8 SURFACE TREATMENT

- A. General
1. Provide smooth surfaces, joints, square edged, struck back and prepared to receive subsequent finishes.

2.9 TOLERANCES

- A. Casting Tolerances: As required to achieve erection tolerances and as follows:

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1. Overall Height and Width
 - a. 10 ft. or under +/- 1/8 in.
 - b. 10 ft. to 20 ft. + 1/8 in., -3/16 in.
 - c. 20 ft. to 30 ft. + 1/8 in., -1/4 in.
 - d. each additional 10 ft. +/- 1/16 in. per 10 ft.
 2. Plane of the Side Mold 1/16 in. per 6 in. in depth
 3. Thickness +/- 1/8 in.
 4. Out of Square (difference in length of the two diagonal measurements) 1/8 in. per 6 ft, but not more than 1/4 in.
 5. Insert Location +/- 1/4 in.
- B. After Casting Tolerances
1. Bowing and Warping without intermediate support 1/240 panel dimension
 2. Bowing and Warping with intermediate support 1/360 panel dimension

2.10 SOURCE QUALITY CONTROL

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.

PART 3 - EXECUTION

3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and erect the work of this Section, including equipment, components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely

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2. Variation from level +/- 1/8 in. in any 20 ft.
3. Panel alignment +/- 1/8 in. jog in alignment of edge.
4. Variation of anchors and fasteners from established position in plan +/- 1/4 in.
5. Face width of joints +/- 1/8 in. for joints 1/2 in. wide or greater.

G. Field cutting of precast elements shall not be permitted without acceptance of Architect.

3.5 CONNECTIONS

- A. Connections shall be designed and detailed by the fabricator under the direction of a licensed Professional Engineer registered in the State of New Jersey.
- B. Bolting
 1. Tighten bolts beyond snug gradually and in sequence to avoid local overstressing of concrete.
 2. When high strength bolts are used, the AISC specifications shall apply including values as noted therein. Tighten high strength bolts to one turn beyond snug and nick threads to prevent backoff.
- C. Welding, filler metal, welding techniques and procedures shall be in accordance with AISC specification for the "Design, Fabrication and Erection of Structural Steel for Buildings," and AWS "Structural Welding Code," "Filler Metal Specifications," and "Arc and Gas Welding in Building Construction."
 1. Do not weld until adjacent elements to be connected have been aligned, firmly seated and braced. Control heat build-up by limiting voltage, electrode size, and rate. Spalled or heat damaged concrete around weldments is not acceptable.
 2. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.

3.6 FIELD PAINTING

- A. Touch-Up Painting of Metal Surfaces:
 1. After erection in the field, touch-up marred and abraded galvanized surfaces with the specified paint in accordance with ASTM A780. Touch up surfaces that have received shop applied ferrous metal primer using surface preparation and paint system as recommended by the manufacturer of the ferrous metal primer.
 2. Surfaces requiring touch-up painting shall be cleaned and primed as soon as

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practicable after erection and before excessive rusting or other damage occurs to surfaces from weather or other exposure.

3. Touch up bolted connections with zinc rich paint. Heads of bolts, surfaces which are unpainted because of welding, field connections and other areas on which the shop coat has been abraded or otherwise damaged shall be touched up after erection.

3.7 FIELD CUTTING

- A. Field cutting of holes may be done only with the Architect's acceptance, the consent of the precast contractor and only with power saws or core drills.
- B. Maximum hole size is 6 in. diameter or as limited by member size or location.
- C. Cracks, spalls and sharp corners created by field cutting are to be ground, eased, and patched with epoxy type bonding and patching compounds.

3.8 FIELD QUALITY CONTROL

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Examination and Acceptance
 1. Tolerances: Units whose dimension vary in excess of specified tolerances are unacceptable and will be rejected.
 2. Imperfections: The Contractor shall discard and replace units which are cracked, chipped, stained or otherwise damaged. Patched units are not acceptable, except in specific instances when approved by the Architect, the unit may be repaired.
- C. The Contractor shall be responsible for the testing and/or inspection resulting as a consequence of the following:
 1. Work not evidencing compliance with this Specification.
 2. Testing to verify the adequacy of work done without prior notice, without proper supervision, or contrary to standard construction practice.

3.9 PATCHING

- A. Replace unit which exhibits damage to surfaces, finish, corners or which is broken or cracked due to shrinkage, transportation, handling or erection, except that in specific instances when accepted by the Architect, the unit may be repaired in place in accordance with accepted submitted remedial procedures.
- B. Repairs shall be limited to minor repair of surface or edge damage and are subject to acceptance by the Architect. Major repairs shall not be attempted until an engineering evaluation is made by a Professional Engineer, to determine whether the unit will be

SECTION 03450 – PRECAST CONCRETE

structurally sound.

3.10 CLEANING

- A. Upon completion of the work thoroughly clean precast units, after erection to remove weld marks, other markings, dirt, and stains, starting at the top, by scrubbing with a solution of soap powder, using stiff fiber brushes, followed by a thorough rinsing with clean water.
- B. Do not use cleaning materials or processes that could change the appearance of precast concrete finishes.

3.11 PROTECTION

- A. Protect and maintain the precast work through the construction period so that it will be without indication of wear or damage at the time of preliminary acceptance by the Owner. During construction, protect exposed tops of units in place at end of each day's work and in bad weather. After erection, protect units adjacent to materials handling hoists and entrances. Normal weathering of exposed work is permitted during the construction period if other construction activities or conditions do not interfere and result in an unacceptable condition of the work at the time of preliminary acceptance by the Owner.

END OF SECTION



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #2 – Revised Specification Section 08910 –
Aluminum Windows

9/17/12

SECTION 08910 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. General: Provide aluminum windows in accordance with requirements of the Contract Documents. The Work of this Section includes, but is not limited to the following:

1. Aluminum fixed **and operable** windows.
- ~~1.2.~~ **Hardware for operable units.**
- ~~2.3.~~ Glass and glazing for aluminum windows.

B. Related Work Specified Elsewhere

1. Sealants and joint fillers installed at interface of aluminum window assemblies and other building components are specified under Section 07920 "Joint Sealants".
2. Glass and glazing is specified in Section 08810 "Exterior Wall Glazing".

1.2 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.

1. Aluminum Association (AA)
 - a. Aluminum Standards and Data
 - b. Designation System for Aluminum Finishes
 - c. Engineering Data for Aluminum Structures
2. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".
3. American Architectural Manufacturers Association (AAMA)
 - a. ANSI/AAMA/NWWDA 101/1.S.2 "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Sliding Glass Doors".

SECTION 08910 - ALUMINUM WINDOWS

4. American Welding Society AWS
 - a. AWS D1.1 "Structural Welding Code - Steel".
 - b. AWS D1.2 "Structural Welding Code - Aluminum".
5. United States Green Building Council (USGBC): Leadership in Energy & Environmental Design (LEED™): Green Building Rating System for New Construction & Major Renovations (NC) Version 2.2.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements

1. General: Except as otherwise indicated, comply with applicable requirements including structural loading, air infiltration, water resistance, thermal and condensation resistance and fabrication specifications specified in ANSI/AAMA 101 classification F-HC40.
2. Wind Loading: Design, fabricate and install aluminum windows so that the total, installed, glazed unit will withstand the inward and outward pressure normal to the plane of the window as shown on Structural Drawings.
3. Building Movement: Design, fabricate and install aluminum windows to withstand building movements including loading deflections, shrinkage, creep, seismic and similar movements.
4. Full Load Deflection: Maximum full load deflections, normal to the plane of the wall for any member of the window frame or aluminum panel shall not exceed 1/175 of the span of the glass. Glass, sealants and interior finishes shall not be included to contribute to framing member strength, stiffness or lateral stability. Limit vertical deflection of glazing framing system so as to prevent ponding of water within the glazing rabbet. Deflection of members under 1.5 times design wind load shall not result in sealant failure. Splice joints which permit thermal and other movements by slippage within the joint shall be assumed to have zero moment capacity. Submit engineering calculations to show maximum deflections based on full panel loads, on installed units, uniformly distributed.
5. Design Load Pressures: Permanent deformation, disengagement or breakage of frame members and weld or fastener damage or failure shall not occur under loading equal to 1.5 times the design load pressures, positive or negative, as shown on Drawings. Permanent deformation is defined as deflection without recovery exceeding length/1000.

SECTION 08910 - ALUMINUM WINDOWS

6. Anchorage: Anchorage disengagement or breakage shall not occur when installed unit is subjected to a force equal to 2.5 times the design load. Anchorage shall be properly braced in three orthogonal directions (vertical, transverse, and longitudinal) to resist specified loadings from any direction (both positive and negative pressure).
 7. Water Drainage: Make provisions at sill to drain water and condensation to exterior face of the frames.
 8. Temperature Requirements: Design, fabricate and install aluminum window component parts to provide for expansion and contraction of the window over an ambient exterior temperature range and exterior metal surface temperature of -10 deg. F. through +180 deg. F.; an interior temperature range of +55 deg. F. to 100 deg. F. without buckling, sealed joint failure, glass breakage, undue stress on members or anchors, and other detrimental effects.
 9. Thermal Transmittance: Provide window units which have been tested in accordance with ASTM C1363 utilizing a guarded hot box and resulting in a "U" value not to exceed 0.69.
 10. Air and Water Control: Provide tight joints and effectively seal windows against water leakage and air infiltration. Water leakage is defined as the appearance of uncontrolled water, other than condensation, on inboard part of window or panel, either during testing or under actual weather conditions. Uncontrolled water is defined as leakage that is not contained and/or drained away in a manner as to cause no damage to the wall or adjacent construction of finishes. When tested in accordance with ASTM E283, at 6.24 psf test pressure, the air infiltration shall not exceed 0.06 cfm/ft.² of window area for fixed portions of window and 0.10 cfm per linear ft. 12 in. of crack length for operable portions of window.
 11. Unacceptable Conditions: Vibration harmonics, wind whistles, noise or vibration created by thermal movement, structural movement, or wind; thermal movement transferred to building structure; loosening, weakening or failure of fasteners, attachments or other components.
 12. Design Modifications: Make design modifications of work shown only as may be necessary to meet performance requirements and coordinate the work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Architect for review.
- B. Green Building Performance Criteria: NJSDA has determined that this project may, in the future, be considered to be a LEED certified project and as such the following requirements shall be complied with as related to materials and systems specified herein.
1. The manufacturing locations and origin of raw materials for the exterior wall

SECTION 08910 - ALUMINUM WINDOWS

glazing shall be identified and documented if within 500 miles of the project site.

2. The post-industrial and/or post consumer recycled content (by weight) of the major metal components (at minimum stainless steel, aluminum and steel) shall be identified and documented.
3. All field-applied adhesives, sealants, primers, paints and coatings used on the interior of the building shall meet the volatile organic compound (VOC) and chemical component limitations as defined in Section 01520 "Volatile Organic Compound Limits", VOC contents shall be identified and documented.
4. Field Applied Sealants and Adhesives used on this Project shall comply with VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, and sealants used as fillers shall meet or exceed the requirements of Bay Area Air Quality Management District Regulation 8, Rule 51; as follows (expressed in grams of VOC per liter).

1.4 SUBMITTALS

- A. Product Data: Furnish a material list with technical data documenting the location and primary function, quality, and performance of each material component or system to be used in the Work. In addition, submit a statement that each product to be furnished is recommended for the application shown.
- B. Shop Drawings: Provide shop drawings for the fabrication and installation of the aluminum windows Work. Prepare details at not less than 3 in. = 1 ft. minimum scale. Shop drawings shall bear seal of a Professional Engineer registered in the State of New Jersey . Include the following:
 1. Show typical details of conditions for every member, joint, anchorage and glazing system. Show details of support system, method of attachment to building structure, anchorage details and interface with adjacent work.
 2. Show component locations and intersection details, method of isolating dissimilar materials, provisions for expansion and contraction, method of drainage of the system including gutters, weeps and flashings including method of drainage of condensation which might form external to the vapor barrier and reglazing sequence both in the factory and remedial for the field.
- C. Setting Drawings: Submit setting drawings and templates for the location of aluminum window items that are to be embedded in or anchored to concrete or masonry.
- D. Glazing Schedule: Submit a glazing schedule utilizing the same designations shown on Drawings for glazed windows listing glass types and thicknesses for each size opening and location.

SECTION 08910 - ALUMINUM WINDOWS

- E. Samples: Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor.
1. Submit 3 sets of samples for each metal type, metal finish and color required. Submit sample finishes on 12 in. lengths of metal having the specified alloy, temper, pretreatment and thickness of metal required for the work, showing the maximum range or variation in color and shade.
 2. Submit one sample corner of window unit, representative of fabrication techniques and workmanship of the final products.
 - ~~2.3.~~ **Submit one sample of each type of window hardware specified.**
- F. Calculations: Provide calculations for items with specified design loads. Calculations shall bear the seal of a Professional Engineer registered in the State of New Jersey. Submit the following:
1. Engineering calculations to show that maximum deflections do not exceed specified performance requirements under full design loading.
 2. Structural calculations for frames, panels, connections and window anchorage system.
 3. Submit calculations of expansion and contraction.
- G. Quality Control Submittals:
1. Test Reports
 - a. Up-to- date (within 5 years), certified test reports from an independent testing laboratory stating that similar sized aluminum windows have been tested and meet the performance for structural requirements and for air and water infiltration and comply with references.
 - b. Up- to- date (within 5 years) certified test reports from an independent testing laboratory stating that similar sized aluminum windows have been tested and meet the performance requirements for thermal resistance and comply with references.
 - c. Copies of the following laboratory test reports:
 - 1) ASTM B137 - Anodic Coating Weight

SECTION 08910 - ALUMINUM WINDOWS

2) ASTM B244 - Anodic Coating Thickness

3) ASTM B136 - Stain Test

2. Certificates

a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

b. Manufacturer's and fabricator's certification indicating that anodic coating complies with the Contract Documents.

H. Closeout Submittals:

1. Warranties: Special warranties specified.

2. Maintenance Data: Two (2) copies of an assembled and bound maintenance manual, describing the materials, devices, and procedures to be followed in cleaning and maintaining the aluminum windows. Include manufacturer's brochures describing the actual materials used in the work, including metal alloys, finishes, glass, gaskets and other major components.

1.5 QUALITY ASSURANCE

A. Qualified Installer: The aluminum window Work shall be performed by a firm having 5 years experience in the installation of specified materials on comparable projects. The firm shall have the approval of the aluminum window fabricator/manufacturer. The applicator shall provide evidence of successful completion of work of similar scope to that shown and specified for this Project using similar systems.

B. Source Limitations: So that there will be undivided responsibility, award the aluminum window work to a single firm specializing in this type work, with a minimum of 5 years continuous operations and experience which has successfully completed, comparable sized projects. This Work includes but is not limited, to designing, engineering, fabricating, transporting and erecting the aluminum windows so that performance and aesthetic requirements are complied with.

C. Engineering Responsibility: Engage the services of a qualified Professional Engineer who is licensed to practice in the State of New Jersey and who is experienced in providing engineering services of the kind indicated to prepare or supervise the preparation of data

SECTION 08910 - ALUMINUM WINDOWS

for the aluminum windows, including drawings, testing program development, test-result interpretation, and comprehensive engineering analysis that show the systems' compliance with the specified requirements. Engineering services are defined as those performed for installations of systems that are similar to those indicated for this Project in material, design, and extent.

- D. Intended Aesthetic Effects: Do not modify intended aesthetic effects, except with approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data for review.
- E. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- F. Mock-Up(s) and Testing
 - 1. Visual Mock-Up(s)
 - a. Provide in-situ, where directed, in coordination with exterior wall CMU work, a mock-up of the aluminum window for visual review and representative of the finished Work. Provide joint conditions, anchorage, specified glass, panels, finish and other features as will be used in the final Work.
 - b. Clean aluminum windows including glass installed in mock-up with materials and techniques intended for use on the Project.
 - c. Replace unsatisfactory Work as required to obtain approval. Mock-up may be installed in final locations and if accepted, may be utilized in the finished work. The approved visual mock-up will become the standard of workmanship for the project. The approval of the visual mock-up does not relieve the Contractor of its obligation to perform the work in accordance with the Contract Documents
- G. Pre-Installation Meeting: Prior to the start of the Work, meet at the Project site to review material selections, methods and sequence of installation, special details and conditions, standard of workmanship, quality control requirements, job organization, coordination with other trades, and other pertinent topics related to the Work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery of Fabricated Units: Deliver fabricated window units and component parts to project site completely identified in accordance with erection diagrams. Store in accordance with manufacturer's instructions, above grade on dunnage, properly protected from the weather and construction activities.

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- B. Protective Coatings or Coverings: Temporary coating and coverings may be furnished at manufacturer's or Contractor's option to protect the Work during shipment and construction. Such protection shall avoid development of non-uniformity in finishes, shall not impart a residue which would adversely affect the adhesion of sealants, nor cause other deleterious effects in the Work. Temporarily remove protection when requested for inspection of finishes, and completely remove protection when no longer required.
- C. Material Delivery: Deliver materials to Project site in manufacturers' unopened containers, fully identified with trade name, color, size, hardness, type, class, and grade. Store each item in accordance with manufacturer's instructions. Deliver, store and handle glass in accordance with manufacturer's recommendations; protected from weather, staining and damage. During storage and handling of glass provide cushions at edges to prevent impact damage. Protect glass from scratches and abrasion.

1.7 PROJECT/SITE CONDITIONS

- A. Field Glazing: Do not perform glazing when temperature is below 40 deg. F. , unless the manufacturer of the glazing materials specifically recommends application of his materials at lower temperatures. If job progress or other conditions require glazing work when temperatures are below 40 deg. F. (or below the minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with copy to the Architect, the conditions under which glazing work was performed and the provisions made to ensure satisfactory work.
- B. Bulk Compounds: Do not proceed with installation of bulk compounds during inclement weather unless requirements and manufacturer's instructions can be complied with and unless the work can proceed in accordance with the agreements of the pre-installation meeting. Do not proceed with the installation of sealants under extreme temperature conditions which would cause joint openings to be at either maximum or minimum width or when extreme temperatures or heavy wind loads are forecast during the period required for initial or nominal cure of sealants. Whenever possible, schedule the installation and cure of sealants during periods of mean temperatures (nominal joint width shown) so that subsequent stresses upon the cured sealants will be minimized.

1.8 WARRANTIES

- A. Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
 - 1. Special Warranty, Aluminum Windows: Provide a written warranty, for a period of ten (10) years. Repair or replace window work and correct leaks or other

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defects in material or workmanship during the warranty period. Warranty shall be signed by the manufacturer and the single firm awarded the window work. Upon notification of defects, within the warranty period, make the necessary repairs or replacements at the convenience of the Owner. Defects are defined to include, but not limited to the following:

- a. Failure of the system to meet performance requirements including but not limited to excessive deflection, racking, warpage, excessive water leakage or air infiltration.
 - b. Deterioration, fading, excessive non-uniformity, pitting, cracking, peeling, crazing or discoloration of finishes and other materials beyond normal weathering.
 - c. Deflection exceeding specified limits.
 - d. Thermal stresses transferred to the building structure.
 - e. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing.
 - f. Noise or vibration created by thermal and structural movement and wind.
 - g. Loosening or weakening of fasteners, attachments, and other components.
 - ~~g~~. **h. Failure of operational parts to function normally.**
2. Warranty, Anodized Coatings: Provide a written Warranty, for a period of five (5) years warranting that the anodized aluminum will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, or corrode; within limits defined as follows:
- a. "Excessive fading": means a change in appearance which is perceptible and objectionable as determined by the Architect when viewed visually in comparison with the original color range standards.
 - b. "Excessive non-uniformity": means non-uniform fading during the period of the Warranty to the extent that adjacent panels have a color difference greater than the original acceptable color range.
 - c. "Will not crack, peel, pit or corrode": means there shall be no cracking, peeling, pitting or other type of corrosion discernible from a distance of 10 ft., resulting from the natural elements in the atmosphere.
 - d. Upon notification of defects, within the warranty period, make the

SECTION 08910 - ALUMINUM WINDOWS

necessary replacements at the convenience of the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Products specified herein are the design standard, ~~“TR-9650 5-1/4 inch Depth Architectural Fixed Windows”, as manufactured by TRACO.~~ **“Series 450X 4 1/2” Heavy Commercial Projected Flush-Face Window”, fixed and out-swing casement as manufactured by EFCO.** Equivalent products of the following manufacturers will be acceptable provided they meet those established standards:
1. **TRACO/Kawneer EFCO.**
 2. Wausau.
 3. Graham.
 4. Or approved equal.

2.2 MATERIALS

- A. Aluminum Extrusions: Shapes as shown and as required fulfilling performance requirements, but not less than 1/8 in. thick, unless otherwise shown. Suitable alloy and proper temper for extruding and fabricating with adequate structural characteristics, and suitable controlled alloy and temper as recommended by aluminum manufacturer to provide required color and color matching.
- B. Aluminum Sheets and Plates: Sizes and minimum gauge as shown and as required fulfilling performance requirements. Suitable alloy and proper temper for forming and fabricating with adequate structural characteristics and suitable for finishing as specified.

2.3 FASTENERS, ANCHORAGE AND REINFORCING

- A. Anchor Assemblies: 3-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer/fabricator.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A23 or ASTM A153 requirements. Provide bolts, washers and shims as required, hot dip galvanized, ASTM A153, Class A.
 2. Steel Anchorage: Anchor assemblies secured to structural steel framing shall be fabricated in accordance with the criteria governing structural steel and where

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exposed, architecturally exposed structural steel

- B. Steel Angles, Plates, Anchors, Clips, Bars, Rods and other Steel Accessories Required to Join or Reinforce Assembly of Aluminum Components: ASTM A36 and ASTM A283 , galvanized or, if galvanized is not compatible with alloy of component parts, shop painted with primer specified herein after cutting to size. Galvanize ferrous metals embedded in concrete or masonry unless otherwise shown or specified.
- C. Aluminum Angles, Plates, Bars, and other Aluminum Members Required to Join or Reinforce Assembly of Aluminum Components: Alloys recommended by manufacturer or fabricator to develop required strength of assembly.
- D. Fasteners and Accessories: Manufacturer's standard non-corrosive fasteners and accessories that are compatible with materials used in the window framing system and with exposed portions that match finish of the windows. Where movement should be expected, provide 3-way adjustable anchors that accommodate fabrication and installation tolerances and slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or a similar material recommended by the manufacturer.
 - 1. Items For Bolting Aluminum Extrusions And Connecting Members: Stainless steel complying with ASTM A193, Series 300; unless otherwise recommended by the window manufacturer.
 - 2. Items For Anchoring Window To Supporting Structure: Zinc- coated steel fasteners complying with ASTM A307.
 - 3. Items For Securing Exterior Aluminum Cap Retainers: AISI Series 300 stainless steel screws complying with ASTM A193.
 - 4. Where fasteners anchor into aluminum less than 1/8 in. thick, provide non-corrosive pressed-in splined grommet nuts or other type reinforcement to receive fastener threads.

2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Glass and Glazing: As specified in Section 08810 "Exterior Wall Glazing".
- B. Sealants: As specified in Section 07920 "Joint Sealants".
- C. Thermal Separators: Polyvinylchloride, 50 Shore A durometer hardness +/- 5 or poured homogeneous structural polyurethane of a cross sectional profile, interlocking with aluminum extrusions (minimum 3/8 in. separation) forming an integral structural unit.
- D. Stainless Steel Flashing: ASTM A666, Type 304, dead soft fully annealed except where harder temper required for forming or performance; 0.015 in. (28 gage) thick unless

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otherwise shown, finish No. 2D. Provide 60 - 40 tin/lead solder, with acid-chloride type flux, except use rosin flux over tinned surfaces in accordance with ASTM B32.

- E. Weep Baffles: PVC coated, reticulated, flexible open cell reticulated polyurethane foam; 30-40 pores per 1 in. or as recommended by the fabricator. PVC coating shall have a bacteriostat additive added to the formulation. Provide "PVC Coated SIF-G Industrial Foam" (Foamex, Corp.) or approved equal.
- F. **Weatherstripping: AAMA 701 & AAMA 702 "Voluntary Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals". Provide compressible, removable and replaceable type weatherstripping formed from neoprene or EPDM complying with ASTM D2000 or molded expanded EPDM or neoprene complying with ASTM C509, grade as selected by the manufacturer.**

2.5 OPERABLE WINDOW HARDWARE

- A. **Hardware for Operable Windows: AAMA Series 900 for hardware appropriate to each specified type window. Provide manufacturer's standard or custom design for operation specified; fabricated of stainless steel complying with ASTM A167 or ASTM A666 or white bronze and finished to match frame of window.**
 - 1. **Provide the following hardware for each window noted as "Operable".**
 - a. **Butt hinges.**
 - b. **4" child-safety limiter.**
 - c. **Multi-point locking system, single accessible lever.**
 - a.d. **Pull handle on operable panel.**

2.65 PAINTS AND COATINGS

- A. Rust Inhibitive Primer for Ferrous Metals Not Galvanized: Compatible with finish coats of paint (if any) of the respective dry film mil thickness specified; One of the following:
 - 1. "Hi-Build Epoxoline II Series N69/N69F" (Tnemec Co. Inc.); 4.0 - 6.0 mils d.f.t.
 - 2. "Carboguard 890Series" (Carboline Co.); 4.0 - 6.0 mils d.f.t.
 - 3. "Amercoat 383 H" (Ameron Protective Coatings); 4.0 - 6.0 mils d.f.t.
 - 4. Or approved equal.
- B. Galvanizing Repair Paint: Zinc rich paint for repairing galvanized surfaces and field welds in compliance with ASTM A780. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A123 or ASTM A153 as applicable.

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- C. Dielectric Separator: Cold applied, asphalt emulsion type complying with ASTM D1187, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall minimum dry film thickness of 25 mils or heavy coating of epoxy paint in minimum 2.0 mil dry film thickness.

2.76 FABRICATION

- A. General: Provide manufacturer's standard fabrication, accessories and finish complying with paragraphs "References" and "Performance Requirements". Units shall be reglazable without dismantling of sash framing. Provide a complete system of anchorage for glazed aluminum window units. Allow for erection tolerances and provide for movements of window units and enframing due to thermal expansion. Fabricate aluminum windows at the manufacturer's shop to the fullest extent possible and before applying finishes.
- B. Welding, Cutting, Drilling, Mitering and Fitting Of Joints: Complete the welding, cutting, drilling, mitering and fitting of joints prior to finishing. Weld with electrodes and by methods recommended by the metals manufacturer in accordance with applicable recommendations of the AWS. Use only methods which will avoid distortion or discoloration of exposed faces. Grind weld areas smooth before proceeding with other treatment.
- C. Fastenings: Conceal fastenings unless otherwise shown or specified. Fit and assemble work in the shop insofar as practicable. Carefully fit and match work with continuity of line and design, using rigidly secured joints with hairline contact, mitered corners, unless otherwise shown. Reinforce members and joints with steel or aluminum plates, bars, rods or angles for rigidity and strength as needed to fulfill performance requirements. Use concealed stainless steel fasteners for jointing which cannot be welded.
- D. Sills: Fabricate aluminum panels and sills utilizing aluminum plate. Finish sills to match finish of aluminum frames. Reinforce in concealed locations as required to meet specified performance criteria and to resist anchorage stresses. Fasteners or anchorage shall not be exposed to view on finished face of sill.
- E. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Sealant Manual" and "Glazing Manual".
- F. Weepholes: Provide weepholes and internal water passages in the glazing recess as recommended by the glass manufacturer to conduct infiltrating water to the exterior. Provide weep baffles secured to inside of frame behind weepholes to prevent water migration.
- G. Thermal Separator: Fabricate aluminum window units with an integrally concealed low conductance thermal separator, located between exterior metal material and metal material exposed on the interior in a manner that eliminates direct metal-to-metal contact.

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- H. Subframes: Provide subframes with anchors for window units where shown of profile and dimensions indicated fabricated from not less than 1/8 in. thick extruded aluminum. Miter or cope corners and weld and dress joint smooth with concealed mechanical joint fasteners. Finish to match finish specified for frames.
- I. Mullion and Cover Plates: Provide mullion and cover plates where shown matching window units complete with anchors for support to the structure and for the installation of the window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Comply with specified performance criteria.
- J. Mullion Covers: Aluminum windows utilizing exposed exterior mullion covers of the snap-on type design, provide a minimum of two (2) concealed fasteners per 5 ft. length to prevent displacement or accidental removal of trim.

2.87 FINISHES

- A. Aluminum Finishes: As shown for the respective units and matching the reviewed samples. Remove scratches, abrasions, dents, and other defects prior to finishing operations. Perform this work in addition to finish treatment specified. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations unless otherwise specified.
 - 1. Anodized Finish
 - a. Natural Anodized: AA-M12C22A41, Class I Architectural: clear film thicker than 0.7 mils complying with AAMA 611.
 - b. Sealing: Anodized finishes shall be fully sealed by the manufacturer or processor according to procedures recommended by the licensor of the process.

2.98 SHOP PAINTING FOR FERROUS METAL

- A. General: Shop paint ferrous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, unless otherwise specified.
- B. Removal Of Oil, Grease And Similar Contaminants: Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to any additional surface preparation specified.
- C. Metal Surfaces: Clean and prepare metal surfaces before applying shop coat. Remove rust and mill scale in accordance with SSPC SP-3 "Power Tool Cleaning".

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- D. Application of Primer: Immediately after surface preparation, apply primer in accordance with manufacturer's instructions. Use painting methods which will result in full coverage and dry film thickness specified.

PART 3 – EXECUTION

3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Check carefully the provisions for anchorage and adjustment, allowances for expansion and contraction, and conditions of preset flashings and flashing connections. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected..
- B. Verify dimensions of openings by field measurements so that aluminum windows and related items will be accurately designed, fabricated and fitted to the structure. Tolerances for supporting structure are specified in other Sections. Furnish anchor bolts and inserts for setting in concrete formwork or masonry indicated to support aluminum windows.

3.3 COORDINATION AND SCHEDULING

- A. Sequence of Installation: Schedule installation of the aluminum windows in sequence with related elements of the Work specified in other Sections to ensure that window assemblies, including flashing, trim, and joint sealers, are protected against damage from effects of weather, age, corrosion, and other causes.
- B. Coordination: Coordinate aluminum windows and related metal work with the work of other Sections and provide items to be placed during the installation of other work. Place such items, including connectors and anchors, accurately in relation to the final location of windows

3.4 PREPARATION

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

SECTION 08910 - ALUMINUM WINDOWS

3.5 INSTALLATION

- A. General: Install aluminum windows supported on shims and secured in place by bolting to clip angles and similar supports anchored to supporting structure. Use only the types of equipment, wedges, spacers, shims and other items during installation which will not corrode nor stain or mar the finish surfaces.
- B. Assumed Design Temperature: Dimensions shown on Drawings are based on an assumed design temperature of 70 deg. F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.
- C. Installation: Install aluminum windows plumb and true in alignment with established lines and grades without warp or rack of framing members. Anchor securely in place. Install components to drain water passing joints and condensation and moisture occurring or migrating within the assembly to the exterior. **Lubricate operable hardware and other moving parts.** Do not erect members which are warped, bowed, deformed or otherwise damaged to such extent as to impair strength or appearance. Remove and replace members damaged in the process of erection. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and freeze-up of moving joints. Separate dissimilar metals with two coats of dielectric separator. Do not extend coating onto exposed or finished surfaces. Prime paint concealed ferrous metal with specified metal primer. Seal joints in a concealed manner, unless exposed sealant is shown. Comply with requirements of Section 07920 "Joint Sealants".
- D. Cutting and Trimming: Cut and trim component parts during erection only with the approval of the manufacturer or fabricator and in accordance with his recommendations. Do not cut through reinforcing members. Restore finish completely to protect material and remove evidence of cutting and trimming. Remove and replace members where cutting and trimming has impaired strength or appearance.
- E. Welding and Soldering: Weld with electrodes and by methods recommended and in accordance with appropriate recommendations of the AWS. Use only methods which will avoid distortion or discoloration of exposed faces. Grind exposed welds smooth, using only clean wheels and compounds which are free of iron or iron compounds. Restore finish of component parts after welding and grinding. Solder only to fill or seal joints (not to form structural joints). Grind smooth and restore finish. Paint clip angles and other ferrous metal parts not exposed to view with specified rust inhibitive paint. Seal joints in a concealed manner.
- F. Erection Tolerances: Erect aluminum windows within the following tolerances:
 - 1. Variation From Plumb Or Angle Shown: 1/8 in. maximum variation in 10 ft. height or 10 ft. run, non-cumulative.

SECTION 08910 - ALUMINUM WINDOWS

2. Variation From Level Or Slopes Shown: 1/8 in. maximum variation in 10 ft. height or 10 ft. run, non-cumulative.
3. Variations From Theoretical Calculated Position: Variations from theoretical calculated position as located in plan or elevation in relation to established floor lines, column lines and other fixed elements of the structure, including variations from plumb and level:
 - a. 1/8 in. maximum variation in any column-to-column space, floor-to-floor height or 20 ft. run.
4. Offsets: Offsets in end-to-end or edge-to-edge alignment of consecutive members:
 - a. 1/16 in. maximum offset in any alignment.

3.6 FIELD QUALITY CONTROL FOR EXTERIOR WINDOWS

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
 1. Water Penetration Test: After completion of the installation and nominal curing of sealants and glazing compounds, and before installation of interior trim members, finishes and heating unit covers, test 100% of all exterior aluminum windows for water leaks in accordance with AAMA Standard 501.2 "Specifications for Field Check of Metal Curtain Walls for Water Leakage". Provide powered scaffold, hose, radios, water supply and manpower to perform scheduled tests. Correct deficiencies observed as a result of this test.

3.7 ADJUSTING

- ~~4~~A. **Adjustment: Adjust operating sash of operable aluminum windows to provide an even, tight fit at contact points and weather stripping for smooth operation and weather tight closure. Adjust operable aluminum windows to operate smoothly with hardware and operators functioning properly. Lubricate hardware and other moving parts. Remove and replace any defective parts.**

3.7.3.8 TOUCH-UP PAINTING

- A. Touch-Up Painting: Field paint marred or abraded members after cleaning these areas. Separate dissimilar metals and metals in contact with concrete or masonry with dielectric separator or gaskets. Do not extend coatings onto exposed surfaces.

3.7.3.9 CLEANING

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- A. Maintenance of Installation: Maintain the aluminum windows throughout the construction period in a clean and properly protected condition so that it will not be damaged at the time of acceptance by the Owner. Cleaning and protective methods shall be carefully selected, applied and maintained so that finishes will not become uneven or otherwise impaired as a result of unequal exposure to light and weathering. Remove deleterious materials from surfaces of aluminum and glass immediately. 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. Cleaning: Upon completion of installation, wash exposed surfaces to leave clean and free from blemishes. Clean excess sealant or compound from glass and framing members immediately after application using solvents or cleaners recommended by manufacturers.

3.93.10 PROTECTION

- A. Protection: Protect the Work during erection and construction to avoid non-uniformity of appearance or other defects in the Work. When requested for inspection of finishes, remove and replace temporary protection. Remove protection when no longer required.

END OF SECTION 08910



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #3 – Revised Specification Section 09510 –
Acoustical Ceilings

9/17/12

SECTION 09510 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. General: Provide acoustical ceilings in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
 - 1. Air supply, ducts, connections and diffusers are specified in applicable Division 15 Mechanical Specifications sections.
 - 2. Sprinkler heads and fire protection devices are specified in applicable Division 15 Mechanical Specifications sections.
 - 3. Lighting fixtures attachments devices are specified in applicable Division 16 Electrical specification sections.

1.2 REFERENCES

- 1. United States Green Building Council (USGBC): Leadership in Energy & Environmental Design (LEED™): Green Building Rating System for New Construction & Major Renovations (NC) Version 2.2.

1.3 SYSTEM DESCRIPTION

- A. Performance Criteria
 - 1. Primary Suspension System Deflection Criteria: Finish to lines and levels shown, with maximum deflection not to exceed 1/360 of the span between supports.
 - 2. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - a. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - 1) Flame Spread: 25 or less.
 - 2) Smoke Developed: 50 or less.
 - 3. Minimum Performance Requirements for Acoustic Materials: Provide acoustical materials complying with the following performance requirements, unless otherwise shown or specified:

SECTION 09510 - ACOUSTICAL CEILINGS

- a. Light Reflectance: ASTM E 1477, 0.75 or more.
 - b. Flame Spread: ASTM E84, Flame Spread 25 or less.
 - c. Sound Absorption (NRC): ASTM C423, NRC not less than 0.65.
 - d. Sound Transmission Class (STC): ASTM E90, not less than 35.
4. Seismic Standard: Provide acoustical ceiling systems designed and installed to withstand the effects of earthquake motions in compliance with the following:
- a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580.
 - b. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
 - c. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
- B. Green Building Performance Criteria: NJSDA has determined that this project may, in the future, be considered to be a LEED certified project and as such the following requirements shall be complied with as related to materials and systems specified herein.
1. The manufacturing locations and origin of raw materials for the acoustical ceilings shall be identified and documented if within 500 miles of the project site.
 2. The post-industrial and/or post consumer recycled content (by weight) of the major metal components (at minimum stainless steel, aluminum and steel) shall be identified and documented.
 3. All field-applied adhesives, sealants, primers, paints and coatings used on the interior of the building shall meet the volatile organic compound (VOC) and chemical component limitations as defined in Section 01520 "Volatile Organic Compound Limits", VOC contents shall be identified and documented.
 4. Field Applied Sealants and Adhesives used on this Project shall comply with VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, and sealants used as fillers shall meet or exceed the requirements of Bay Area Air Quality Management District Regulation 8, Rule 51; as follows (expressed in grams of VOC per liter).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets or equivalent printed literature indicating product information correlated to specified requirements and containing specifications and installation instructions for each acoustical material, suspension system and other products

SECTION 09510 - ACOUSTICAL CEILINGS

required, including certified laboratory test reports and other data as may be required to show compliance with the Contract Documents.

- B. Shop Drawings: Submit details and reflected ceiling plans of each type of acoustical ceilings before proceeding with Work. Provide coordination drawings for reflected ceiling plans drawn accurately to large scale and coordinating penetrations and ceiling-mounted items. Show the following:
1. Joint pattern.
 2. Ceiling suspension members.
 3. Method of attaching hangers to building structure.
 4. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinkler heads; access panels; and special moldings at walls, column penetrations, and other junctures with adjoining construction.
- C. Samples: Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor Provide the following:
1. Acoustic board: 12 in. sq. of each type.
 2. Transparent Panel: 12 in. sq. of each type.
 3. Exposed tees and moldings (one of each type): 12 in. lengths.
 4. Accessories: one of each type.
- D. Quality Control Submittals:
1. Product Test Reports: Provide product test reports for each type of acoustical ceiling system based on evaluation of comprehensive tests performed by a qualified testing agency and correlated to specified requirements. Provide the following:
 - a. Laboratory test reports for each acoustical ceiling product with specified Noise Reduction Coefficient (NRC) and Sound Transmission Class (STC).
- E. Closeout Submittals : Submit the following:
1. Warranties: Special warranties as specified.
 2. Maintenance Data: Provide two (2) copies of instructions for maintenance and cleaning of each type of acoustical ceiling system.

1.5 QUALITY ASSURANCE

SECTION 09510 - ACOUSTICAL CEILINGS

- A. Single-Source Responsibility: Obtain each type of acoustical ceiling system, for the entire project, from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Qualified Installer: The acoustical ceiling work shall be performed by a firm having 5 years experience in the installation of materials specified herein on projects comparable to this Project. The firm shall have the approval of the acoustical materials manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- D. Mock-Up(s)
 - 1. Provide mock-up of each type of acoustical ceiling system, minimum 100 ft.² including lighting fixtures, HVAC diffusers, sprinkler heads, speakers and other typical ceiling mounted items, in spaces within the building designated by the Design Consultant. Mock-up(s) shall be representative of the finished work in all respects.
 - 2. Mock-up may be installed in final locations and if accepted, may be utilized in the finished work.
- E. Pre-Installation Meeting: Prior to the start of the Work, meet at the Project site to review material selections, methods and sequence of installation, special details and conditions, standard of workmanship, quality control requirements, job organization, coordination with other trades, and other pertinent topics related to the Work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Packing Shipping Handling and Unloading: Deliver materials to the Project site in manufacturer's unopened containers, clearly indicating manufacturer's name, brand, type, style, size, color, texture and other identifying information.
- B. Storage and Protection: Store materials in a dry location, off the ground and in a manner to prevent damage, deterioration and intrusion of foreign matter. Replace materials which have been damaged or are otherwise unfit for use.

1.7 PROJECT/SITE CONDITIONS

- A. Temperature And Humidity Conditions: Do not install acoustical materials unless temperature and humidity conditions closely approximate the interior conditions which will exist when the building is occupied. Maintain temperature and humidity conditions before, during, and after installation. Plastering, concrete and terrazzo work (including grinding) shall be complete and dry. Windows and doors shall be in place and glazed.
- B. Conditions Prior to Installation: Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

SECTION 09510 - ACOUSTICAL CEILINGS

1.8 WARRANTY

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents
1. Special Warranty: Provide a written warranty, for a period of fifteen (15) years warranting Acoustic Board (**Type ACT01** and **ACT02**) against warping or sagging resulting from defects of materials or factory workmanship and against the occurrence of 50% red dust. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements, at the convenience of the Owner.

1.9 MAINTENANCE

- A. Extra Materials
1. Furnish to the Owner and store at the site where directed, 2% of each type of acoustic tile and acoustic board installed in the Project, packaged in manufacturer's unopened cartons and identified as to contents.
 2. Furnish quantity of each exposed component of suspension systems equal to 2% of amount installed in the Project.

PART 2 - PRODUCTS

2.1 SUSPENSION SYSTEM MATERIALS

- A. Primary Suspension Members
1. General: Provide ceiling support primary suspension members and components complying with ASTM C635 Classification "Heavy Duty", unless otherwise specified of suitable design and adequate strength to support the acoustic materials, light fixtures, diffusers and other items occurring in or on the ceiling.
 2. Wire Hanger Inserts: No. 6 galvanized wire loop and 26 ga. galvanized shell or 14 ga. galvanized steel strap with 5/16 in. dia. hole.
 3. Strap Iron Hanger Inserts: Galvanized mild steel flats, 1 in. x 3/16 in. with 7/16 in. holes punched on center line and lower ends, designed to develop the full strength of hangers.
 4. Hanger Anchorage Devices: Screws, clips, bolts or other devices applicable to the indicated method of structural anchorage for ceiling hangers. Provide anchorage devices sized for five (5) times the calculated load supported.

SECTION 09510 - ACOUSTICAL CEILINGS

5. Hangers: Galvanized, one of the following:
 - a. 3/16 in. x 1 in. steel straps.
 - b. ASTM A510; 1/4 in. diameter mild carbon steel rods.
 6. Carrying Channels: ASTM C754, cold rolled steel channels, 1-1/2 in., 414 lbs. per 1000 linear ft.
 7. Clips: Provide support clips, clamps, fasteners, and other attachment devices as required to connect components and transfer imposed loads of primary suspension system.
- B. Exposed Mechanical Suspension System for Acoustic Board for **Type ACT01**:
Manufacturer's standard design; complying with ASTM C635 Classification "Heavy Duty"; complete with hangers, main tees, cross tees, splices, angle molding, and accessories. Provide components as follows:
1. Primary Suspension Members
 2. Main Tees: 1-1/2 in. high by 15/16 in. wide formed of 0.025 in. galvanized cold-rolled steel section and bottom flange, faced with a roll formed galvanized steel cap.
 3. Cross-Tees: 1-1/2 in. high by 15/16 in. wide formed of 0.025 in. galvanized cold-rolled steel, double web bulb tee section and bottom flange, faced with a roll formed galvanized steel cap. Web ends of cross-tees shall be die formed for the tablock attachment to adjoining tee through the main tee to provide alignment with a minimum of torsional movement and lateral displacement.
 4. Metal wall moldings
 5. Accessories: Galvanized steel, specifically designed for use with the main components.
 6. Exposed Finish: Chemically clean, electro-galvanize and bonderize all rolled formed parts. Finish with a white baked-on enamel coating, to match finish of acoustic boards unless otherwise shown.
 7. Provide one of the following or approved equal:
 - a. "Snap-Grid System 200" (Chicago Metallic Corp.)
 - b. "DX 26 System" (USG Interiors).
 - c. "Prelude XL 15/16" Exposed Tee System" (Armstrong World Industries, Inc.)
 - d. "Classic Stab System" (BPB America Inc.).

SECTION 09510 - ACOUSTICAL CEILINGS

- e. Or approved equal.
- C. Exposed Mechanical Suspension System with ceiling panels for **Type ACT02**: Manufacturer's standard design; complying with ASTM C635 Classification "~~Light~~ **Intermediate Duty**"; complete with hangers, main tees, cross tees, splices, angle molding, and accessories. Provide components as follows:
- 1. Primary suspension members.
 - 2. Main Tees: 1-1/2 in. high by 15/16 in. wide formed of 0.025 in. galvanized cold-rolled steel section and bottom flange, faced with a roll formed aluminum sheet cap.
 - 3. Cross-Tees: 1-1/2 in. high by 15/16 in. wide formed of 0.025 in. galvanized cold-rolled steel, double web bulb tee section and bottom flange, faced with a roll formed aluminum sheet cap. Web ends of cross-tees shall be die formed for the tablock attachment to adjoining tee through the main tee to provide alignment with a minimum of torsional movement and lateral displacement.
 - 4. Aluminum hemmed wall moldings in matching color.
 - 5. Accessories: Aluminum capped galvanized steel, specifically designed for use with the main components.
 - 6. Exposed Finish: Chemically clean and prepare exposed aluminum caps in accordance with NAAMM standards for aluminum sheet finishes. Finish with a white baked-on enamel coating, to match finish of acoustic boards unless otherwise shown.
 - 7. Provide one of the following or equal:
 - a. "~~200-260~~ Snap Grid Aluminum Cap System" (Chicago Metallic Corp.)
 - b. "DXLA System" (USG Interiors).
 - c. "Environmental Aluminum System" (BPB America Inc.).
 - d. Or approved equal.
- D. Metal Wall Moldings for All Systems: Electro-galvanized roll formed steel with manufacturer's standard baked-on white enamel coating to match finish of acoustical material and that fit type of edge detail and suspension system indicated.
- 1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

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3. For narrow faced suspension systems, provide suspension system manufacturer's standard edge moldings that match width and configuration of exposed runners.

2.2 ACOUSTIC PANEL AND TILE MATERIALS

A. Acoustic Board

1. Acoustic Board (**Type ACT 01**): ASTM E1264, Type III, Form 2 ; Square edge lay-in, 24 in. x 48 in. x 5/8 in. thick. Use with 15/16 in. thick standard grid. Provide one of the following or equal:
 - a. "466 Fine Fissured" (Armstrong World Industries, Inc.)
 - b. Equivalent product as manufactured by USG Interiors Inc.
 - c. "SB-197" (BPB America Inc.).
 - d. Or approved equal
2. Acoustic Board (**Type ACT 02**): Provide one of the following or equal:
 - a. "870 Clean Room VL" (Armstrong World Industries, Inc.)
 - b. "1100-CRF-1" (BPB America Inc.).
 - c. "Clean Room ClimaPlus" (USG Interiors).
 - d. Or approved equal.

B. Transparent Panel

1. (**Type ACT03**) Patterned thermoplastic panels designed to fit 1 inch T-bar ceilings. UL approved to meet local building code requirements. 24 in. by 24 in. x 10mm thick panels or cut from larger panels to custom sizes and shapes. One of the following or an equal:
 - a. "Makrolon GP Prismatic P12" (Sheffield Plastics Inc.).
 - b. "Lexan Thermoclear LTCR10" (General Electric Co.).
 - c. "Polygal Polycarbonate Triple Clear Structured Sheet" (Polygal Plastics Ind, Ltd.).
 - d. Or approved equal.

C. Acoustical Metal Panel Materials

1. Acoustical Metal Panel (**Type ACT04**): ASTM E1264, Type XX, Pattern G, Non-

SECTION 09510 - ACOUSTICAL CEILINGS

perforated; 24 in. x 48 in. x 5/8 in. thick. Use with standard 15/16 in. thick Prelude XL Suspension System (Armstrong World Industries, Inc.), or approved equal. Provide manufacturer's standard white color. Provide the following:

- a. "Mfr No. 9418U6A1WH, MetalWorks Vector, Unperforated (Armstrong World Industries, Inc.).
- b. USG Interiors.
- c. BPB America, Inc.
- d. Or approved equal.

2.3 MISCELLANEOUS MATERIALS

- A. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable synthetic-rubber sealant, (with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24),) recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.4 FINISHES

- A. General: As shown for the respective units and matching the reviewed samples. Remove scratches, abrasions, dents, die markings and other defects prior to finishing operations. Perform this work in addition to finish treatment specified. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations unless otherwise specified.
- B. Aluminum Finishes
 1. Organic Coating: Electrolytically applied baked-on acrylic or polyester enamel coating in colors and gloss as selected by the Architect, of minimum 0.80 mils dry film thickness complying with AA-C12C42R1x applied over manufacturer's standard substrate preparation including an acid chromate fluoride phosphate conversion coating.

PART 3 - EXECUTION

3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 EXAMINATION

SECTION 09510 - ACOUSTICAL CEILINGS

- A. General: Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Coordination: Coordinate layout and installation of acoustical ceiling systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies. Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 PREPARATION

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer

3.4 INSTALLATION - GENERAL

- A. Verify all measurements and dimensions at the Project site and coordinate the Work with the work of other trades, with particular attention given to the work of mechanical and electrical trades.
- B. Install all materials and systems in accordance with ASTM C636 and ASTM E580 unless otherwise shown or specified.
- C. Make all exposed surfaces of acoustical units level and flush with all joints straight and true. Neatly cut and fit units around light fixtures and around other items protruding through acoustical ceilings. Install all exposed members with flush hairline joints.
- D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units. Apply continuous ribbon of acoustical sealant on back of vertical leg before fastening to vertical surface. Locate so that sealant will be concealed after installation. Screw attach moldings to substrate 16 in. o.c. maximum, and not more than 3 in. from ends, leveling with ceiling suspension system to a tolerance of 1/8 in. in 12 ft. Miter corners accurately to provide hairline joints and connect securely.
- E. Factory drill acoustic tile occurring at hidden loudspeakers and fire alarm gongs.
- F. Center tile or board pattern both directions in each major space or room as shown or directed and, where possible, adjust pattern so that edge pieces will be not less than 2 unit in width.
- G. Run grain of units in one direction, as shown or directed, and align joints in both directions unless otherwise shown.
- H. Use procedures that will minimize damage or soiling of the units during installation. Replace units which are damaged or cannot be adequately cleaned as directed.

SECTION 09510 - ACOUSTICAL CEILINGS

3.5 INSTALLATION OF MECHANICAL SUSPENSION SYSTEM, GENERAL

- A. Install primary suspension members and mechanical suspension system in accordance with ASTM C636 to support required loads and to prevent deflection in excess of 1/360 of the span between supports. Water or laser level accurately in both directions, leveling to a tolerance of 1/8 in. in 12 ft.
- B. Seismic Bracing: Comply with ASTM E580 "Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in areas requiring Seismic Restraint".
- C. Install suspension systems with hangers supported only from building structural members. Locate hangers not less than 6 in. from each end and spaced 4 ft. maximum along each carrying channel or runner. Coordinate spacing of hangers, carrying channels, runners and molding with the location of electrical fixtures, sprinkler heads, and other items occurring in or on the ceiling. Splay hangers only where required to miss obstructions and offset horizontal force by bracing or other approved methods.
- D. Where ceilings are suspended below ductwork, piping or other building elements which are not suitable for ceiling attachment due to strength limitations, restrictions of local authorities having jurisdiction, or ceiling system manufacturer's limitations, provide additional supplemental framing, supports and related work as required to span beneath these elements from suitable support locations. Design supplemental framing and supports to accommodate the spans and loads to be sustained and to limit maximum deflections to the criteria specified and to finish to the lines and levels shown.

3.6 INSTALLATION OF ACOUSTIC PANEL, EXPOSED SYSTEM

- A. Install board with edges resting on flanges of tees. Cut and fit board neatly against abutting surfaces and penetrations. Support edges by wall moldings.
- B. Install hold-down clips in areas shown and in areas where required by governing regulations or for fire-resistance ratings.

3.7 INSTALLATION OF TRANSPARENT PLASTIC PANELS

- A. Use 1 in. lengths of hemmed aluminum angle (baked enamel coated) molding bent to angles shown to span openings in the ceiling suspension grid. Fit and attach as detailed.
- B. Ensure that panels completely cover the area intended to be covered and that no panel edges or open area of ceiling is showing.

3.8 CLEANING

- A. Clean and repair surfaces that have been stained, marred, or otherwise damaged. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

SECTION 09510 - ACOUSTICAL CEILINGS

3.9 PROTECTION

- A. Protect acoustical ceilings during the construction period so that they will be without any indication of deterioration or damage at the time of acceptance by the Owner.

END OF SECTION 09510



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #4 – Revised Specification Section 11470
Photography Equipment

9/17/12

SECTION 11470 – PHOTOGRAPHY EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

- A. General: Provide photography equipment in accordance with requirements of the Contract Documents. The Work of this Section includes, but is not limited to the following:
1. Fabrication and installation of standard furniture components of base cabinets, wall cabinets, storage cabinets, tables, cabinet under structures for photo dark-room equipment and accessories shelf units, desks, files, and other units as indicated.
 2. Tops, sinks, accessories and mechanical and electrical service fixtures common to laboratory casework are included as work of this Section.
 3. Service fixtures are supplied as part of this work. Field connections of service fixtures is included under mechanical work of Division 15 and electrical work of Division 16.
 4. Fabrication and installation of revolving darkroom door(s) to permit the safe handling of light-sensitive photographic materials with continuous access to the darkroom(s).
 5. Miscellaneous equipment and accessories as shown on enclosed schedule.
- B. Related Work Specified Elsewhere
1. Architectural woodwork is specified under Section 06400 "Architectural Woodwork".
 2. Wood furring, blocking, shims, and hanging strips required for installation of architectural woodwork and concealed within other construction before woodwork installation is specified under Section 06150 "Rough Carpentry".
 3. Casework is specified in Section 12350 "Laboratory Casework".
 4. Steel hangers and framing are specified in Section 05500, "Metal Fabrications".
 5. Finish painting of exposed metal surfaces requiring painting other than prefinished items is specified in Section 09900, "Paints and Coatings"..
 6. Electrical service and connections for motor operators, controls, limit switches and system disconnect switches is specified in applicable Division 16 Electrical specification sections.

1.2 REFERENCES

- A. General: Comply with the applicable provisions and recommendations of references, except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the references, such recommendation or suggestion

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shall be considered mandatory. In the event of conflict between references, this specification or within themselves, the more stringent standard or requirement shall govern.

1. National Electrical Manufacturer’s Association (NEMA): NEMA LD3, “High Pressure Decorative Laminates
2. American Welding Society (AWI)
 - a. AWS D1.1 "Structural Welding Code - Steel".
 - b. AWS D1.3 "Structural Welding Code - Sheet Steel"
3. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".
4. Industrial Fasteners Institute (IFI): "Fastener Standards Book."
5. Architectural Woodwork Institute (AWI): "Architectural Woodwork Quality Standards".
6. Forest Stewardship Council (FSC): “FSC-STD-01-001 “Principles and Criteria for Forest Stewardship”
7. United States Green Building Council (USGBC): Leadership in Energy & Environmental Design (LEED™): Green Building Rating System for New Construction & Major Renovations (NC) Version 2.2.

1.3 SYSTEM DESCRIPTION

- A. Green Building Performance Criteria: NJSDA has determined that this project may, in the future, be considered to be a LEED certified project and as such the following requirements shall be complied with as related to materials and systems specified herein.
 1. The manufacturing locations and origin of raw materials for the photography equipment shall be identified and documented if within 500 miles of the project site.
 2. The post-industrial and/or post consumer recycled content (by weight) of the major metal components (at minimum stainless steel, aluminum and steel) shall be identified and documented.
 3. All field-applied adhesives, sealants, primers, paints and coatings used on the interior of the building shall meet the volatile organic compound (VOC) and chemical component limitations as defined in Section 01520 "Volatile Organic Compound Limits", VOC contents shall be identified and documented.
 4. Field Applied Sealants and Adhesives used on this Project shall comply with VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, and sealants used as fillers shall meet or exceed the re

SECTION 11470 – PHOTOGRAPHY EQUIPMENT

quirements of Bay Area Air Quality Management District Regulation 8, Rule 51; as follows (expressed in grams of VOC per liter).

5. All wood utilized in the photography equipment work obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

1.4 DESIGN CRITERIA

- A. Performance Criteria: Cabinets shall satisfy the following structural test and be certified by a Professional Engineer licensed in the State of New Jersey or independent certified testing laboratory.
 1. Structural Test: A wall hung cabinet 36 in. wide x 30 in. high x 13 in. deep with two (2) horizontal shelves shall be mounted to a stud wall 16 in. on center covered with 5/8 in. gypsum board with three (3) No. 10 screws anchored 3 in. down from the inside of top member and three (3) No. 10 screws anchored 3 in. up from the bottom of the cabinet directly into the studs. The cabinet shall be loaded to a total weight of 1,200 pounds at the same time a cable bridle shall be attached to the side corners and a horizontal load of 600 pounds exerted to pull cabinet away from the wall. There shall be no signs of stress or failure to the cabinet. A shelf 34½ in. long x 12 in. deep shall be supported at each end and loaded to 400 pounds without failure.
 2. Drawer Test: A drawer with a minimum size of 24 in. x 4 in. x 22 in. shall be loaded uniformly with 75 pounds of live load. Operate drawer through 50,000 cycles by opening drawer two-thirds of its travel distance and returning it to closed position, at a rate of 20 cycles per minute. Drawer shall remain operable at completion of test. There shall be no failure in any part of the drawer assembly or operating system. Drawer bottom shall not deflect to a position that interferes with drawer operation.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work. Include the following:
 1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
 2. Summary of forces and loads on walls and jambs.
 3. Include independent laboratory certification that applied finishes complies with specified chemical and physical resistance requirements.
- B. Shop Drawings: Submit shop drawings for the fabrication and installation of the Work including details of each frame type, elevations of door design types, anchorage and accessory items. Prepare details at not less than 3 in. = 1 ft. minimum scale.
 1. Provide shop drawings for darkroom furniture, venting, lighting, silver recovery, plumbing equipment, and revolving darkroom doors Show the locations of con-

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nections to electrical or mechanical services provided as a unit of work under other Sections.

- C. Samples: Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit the following:
1. Submit 6 in. x 6 in. samples of specified finishes, including top material.
- D. Quality Control Submittals: Submit for Architect's information.
1. Certifications
 - a. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
 - 1) Dimension lumber.
 - 2) Timber.
 - 3) Miscellaneous lumber.
 - 4) Plywood.
 - 5) Particleboard.
 - 6) Hardboard.
- E. Closeout Submittals: submit the following:
1. Warranties: Special warranties as specified.
 2. Maintenance Data: Submit the following:
 - a. Maintenance schedule for all equipment.
 - b. Maintenance Manuals: Two (2) copies of bound maintenance manuals, describing the materials, and procedures for cleaning and maintaining photography equipment. Include manufacturer's data describing the materials and finishes used in the work including parts lists.

1.6 QUALITY ASSURANCE

- A. Qualified Installer: The photography equipment work shall be performed by a firm having 5 years experience in the installation of specified materials on comparable projects. The firm shall have the approval of the photography equipment materials manufacturer. The installer shall provide evidence of successful completion of work of simi

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lar scope to that shown and specified for this Project using similar overhead coiling door systems.

- B. **Sole Source Responsibility:** Obtain photography equipment from one source of a single manufacturer for each piece of equipment for the entire project. Obtain accessory products used in conjunction with photography equipment from the photography equipment manufacturers or from sources acceptable to the manufacturers. The manufacturers shall furnish evidence that the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- C. **Regulatory Requirements:** Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction
- D. **Pre-Installation Meeting:** Prior to the start of the Work, meet at the Project site to review material selections, methods and sequence of installation, special details and conditions, standard of workmanship, quality control requirements, job organization, coordination with other trades, and other pertinent topics related to the Work.
- E. **Forest Certification:** Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Packing, Shipping, Handling, and Unloading:** Pack, ship and handle components in accordance with manufacturer's instructions. Protect components during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration. Do not deliver equipment until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate equipment have been completed in installation areas.
- B. **Storage and Protection:** Store components in a dry, well ventilated space, off the ground and covered with non-staining protective wrapping. Cover and keep covered with non-staining protective wrapping.

1.8 WARRANTIES

- A. **General:** Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents.
 - 1. **Equipment Special Warranty:** Provide a written warranty indicating all work of this Section will be free from defects in material and workmanship for a period of two (2) years after Substantial Completion, and that repairs or replacements of said defects shall be performed in a timely manner at no additional expense to the Owner.
 - 2. **Sink Unit Special Warranty:** Fiber laminated products shall be free of defects in

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workmanship and material for a period of two (2) years from date of Substantial Completion, and that repairs or replacements of said defects shall be performed in a timely manner at no additional expense to the Owner.

3. Darkroom Door Special Warranty: Provide a written manufacturer's warranty to the Owner stating that the product is free from defects in material or workmanship for a period of two (2) years under normal use and service, and that repairs or replacements of said defects shall be performed in a timely manner at no additional expense to the Owner.
 4. Silver Recovery System Special Warranty: Provide a written manufacturer's warranty to the Owner stating that the product is free from defects in material or workmanship for two (2) years under normal use and service, and that repairs or replacements of said defects shall be performed in a timely manner at no additional expense to the Owner.
- B. Upon notification of such defects, within the warranty period, make the necessary repairs at the convenience of the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. General: Products specified herein by proprietary designation are the design standard, and establish the quality standards required. Manufacturers offering products to comply with requirements for casework include but are not limited to the following:
1. Fuller & d'Albert, Inc.
 2. Kreolab, Inc.
 3. ~~ESESO Speedmaster.~~
 - 4.3. Or approved equal.

2.2 CASEWORK

- A. Definitions: The following definitions apply to casework units:
1. Exposed portions of casework include surfaces visible when doors and drawer are closed. Bottoms of cases more than 4 ft. above floor shall be considered as exposed. Visible members in open cases or behind doors also shall be considered as exposed portions.
 2. Semi-exposed portions of casework includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case back, drawer sides, backs and bottoms, and back face of doors. Top of cases 6 ft.-6 in. or more above floor shall be considered semi-exposed.

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3. Concealed portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.
- B. Exposed Materials: Do not use exposed faces of lighter-than-average color. Do not use two adjacent faces which are noticeably dissimilar in grain, figure, and natural character markings.
1. Solid Lumber: Clear, dry, sound, selected for compatible grain and color, no defects, of the following species:

Northern Hard Maple
White or Yellow Birch
Red or White Oak
- C. Semi-Exposed Materials
1. Solid Lumber: Dry, sound, selected to eliminate appearance defects. Any species of hardwood, or softwood of similar color and grain to exposed portions.
 2. Plywood: Hardwood, PS-51, Good Grade (1), or softwood PS-1/ANSI A 199.1, Group 1, A-A, INT, of species to match color and grain of exposed members.
- D. Concealed Members
1. Solid Lumber or Plywood: Any species, with no defects affecting strength or utility.
 2. Particleboard: ANSI A208.1, minimum 40 lb/cu. ft. density, Grade 1-M-2 or better.
 3. Hardboard: ANSI A135.4, Class 1, tempered.

2.3 PLASTIC LAMINATE CASEWORK

- A. Darkroom Casework
1. Provide casework in accordance with AWI Section 400B, Premium Grade, for plastic laminate cabinetwork. Provide "Flush Overlay" AWI type cabinet construction unless otherwise noted.
 - a. Thickness and Style: As shown or, if not shown, provide 3/4 in. thick doors, drawer fronts and fixed panels (including thickness of plastic) except where required to be thicker by Standards; and provide flush units.
 2. Face Sheets: NEMA Publication LD3, Grade General Purpose Grade HGS, 0.048 in. nominal thickness, satin finish unless otherwise shown.
 3. Plastic Laminate for External Vertical Surfaces: 0.028 in. thick, General-Purpose Type.

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4. Cabinet Liner Sheets: Intended for use in cabinet interiors; NEMA Publication LD-3, Grade CL20, 0.020 in. nominal thickness.
 5. Plastic Laminate for Concealed Panel Backing: 0.020 in. thick, Backer Type.
 6. Plastic Laminate Colors and Patterns: As selected from manufacturer's standard colors.
- B. Exposed exterior surfaces and semi-exposed surfaces shall be decorative high pressure laminate permanently bonded under pressure to both surfaces of a suitable substrate. Laminate shall have low luster and be chosen from the factory's standard selection. All exterior and interior surfaces shall be able to be cleaned with soap and water. All exposed edges shall be self-edged with black PVC edge banding. All shelf edges shall be edged with PVC banding, matching self color.
- C. All cabinets specified as such shall be manufactured with hinged doors, drawers, and face panels factory attached in an overlay design. Doors shall be capable of opening a full 176 degrees. Easy access to adjustable shelves shall be maintained.
- D. All doors, drawers and face panels shall be manufactured with 1/4 in. reveal and continuously edge banded. Hinges which require cutting the edge band will not be allowed.
- E. Shelves shall be adjustable on 2½ in. centers and shall be furnished with shelf clips capable of securing the shelf in a fixed position.
- F. Each base unit assembly shall be supplied with adjustable leveling legs for each four linear feet of base.
- G. Substrate: High grade monolithic particleboard or flake board with an average of 45 lbs/ft.³ density and a maximum of 12% moisture content.
- H. Properties of Substrate Material:
- | | |
|-------------------------------|---------|
| Modulus of Rupture PSI | 2,700 |
| Modulus of Elasticity | 400,000 |
| Internal Bond PSI | 100 |
| Dimensional Stability Percent | 0.22 |
| Screw Holding Strength: | |
| Face Pounds | 350 |
| Edge Pounds | 220 |
| Density Pounds/Cubic Foot | 45 |
| Thickness Tolerance Inches | 0.005 |
- I. Hardboard: Pre-finished beige color, smooth on one side, uniform and free from defects.
- J. Edgings: PVC edge banding, resistant to all normal laboratory reagents, and guaranteed not to craze or crack.

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- K. Steel Parts: "PaperSafe™" and "FilmSafe™" light-tight drawer lids and "NegView™" light housings, if specified on equipment list or drawing, shall be made of steel paint lock sheet, 20 gauge, painted, or approved equal.
- L. Drawer Box: Kiln dried hardwood 7/16 in. nominal thickness dovetailed joints at all four corners.

2.4 COUNTER TOPS FOR CASEWORK

- A. Grade: Same AWI grade as required for casework (Sec. 400), plastic laminate covered, chemical resistant.
- B. Color, Pattern and Texture: As selected from manufacturer's standard satin-finish sheets.
- C. Counter Construction: As shown or, if details not shown, comply with standards and provide 4 in. high back-splash and end-splash, top mount square butt joint, fully covered with matching plastic laminate, eased edges. Solid, uniform thickness throughout.
 - 1. Exposed Counter Edges: Plastic laminate surface, unless otherwise indicated. Ease exposed edges of overlap sheet.
- D. Plastic Laminated Casework: All surfaces, exposed and semi-exposed must be laminated.

2.5 CASEWORK HARDWARE AND ACCESSORIES

- A. Provide manufacturer's standard finish hardware unit, unless otherwise indicated.
- B. Hinges: Self-closing; fully concealed, nickel plated with opening angle of 176 degrees, fully adjustable. Provide one pair for doors less than 4 ft. high and 1½ pair for doors over 4 ft.
- C. Pulls: Plastic, for drawers and swing doors, mounted with 2 screws fastened from back. Provide 2 pulls for drawers over 24 in. wide. Wall cabinets and apron drawers not provided with pulls.
- D. Drawer Slides: BHMA A156.9, B05091; full-extension, zinc-plated steel drawer slides with steel ball bearings.
 - 1. Drawer Stops: Designed to permit easy removal, and yet prevent inadvertent drawer removal. Provide on all drawers, located on the inside. Drawers shall not rest on web body frames
- E. Adjustable Shelf Supports: BHMA B84072, wrought steel, pin style, mortise mounted.
- F. All doors and drawers shall receive locks in accordance with BHMA A156.11. Provide 2 keys with each cabinet door lock, masterkeyed as directed by Owner.

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2.6 FABRICATION

- A. Fabricate darkroom furniture of dimensions, profiles, and details shown. Include preparations for mechanical, electrical, computer equipment and plumbing work required. Allow for cable conduits entering casework from different directions. In areas where shown or required, provide removable panels and access doors.
- B. Assemble units in the shop in as large components as practicable to minimize field jointing.
- C. Install hardware uniformly and precisely after final finishing is complete. Set hinges snug and flat in mortises unless otherwise indicated. Turn screws to flat seat. Adjust and align hardware so that moving parts operate freely and contact points to meet accurately. Allow for final field adjustment after installation.

2.7 SINK UNIT GLASS FIBER LAMINATED

- A. General:
 - 1. Factory finished units manufactured of blend of resins developed especially to resist the corrosive effects of rapid fixers, color bleaches, iron chlorides, and other chemicals required in photographic and graphic arts processing.
 - 2. Hand lay-up each unit for molded one-piece fabrication using highly polished molds to produce smooth homogeneous surface with radius outside and inside corners.
 - 3. Construct sink bottom to ensure positive drainage while supporting processing trays and tanks in level position.
 - 4. Remove traces of materials which may be toxic or incompatible with other building materials.
 - 5. Prepare each unit for installation on cabinet/stand to facilitate quick assembly and disassembly for installation. Refer to casework specifications for sink base requirements.
- B. Mold each sink unit to develop maximum strength and rigidity in each integral unit with min. 0.25 mm gel coat thickness and min 5 oz./ft.² of glass fiber mat. Apply gel coat in two coats and catalyze with max. 2½ % keystone peroxides, with first coat fully cured before application of second coat. Apply back-up resins and reinforcing in layers, working out bells or voids between gel coat and mat, using extra layers of mat at points of stress. Use min. 40% by weight fiberglass mat content. After completion of required mat layers, bag down sinks under vacuum and roll out to ensure proper and even distribution of resin. Set and thoroughly cure sink units under min. 1200 psf pressure and aged to obtain min. 95 percent polymerization of polyester resins.
- C. Colors: Select each sink unit color from standard manufacturer's finishes and cabinet/stand finishes from manufacturer's standard offerings.

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D. Factory Plumbing

1. Plumbing: Each sink unit shall be factory plumbed as shown on the drawings or specified herein.
2. All faucets, valves, spouts, vacuum breakers, circulation systems, temperature blenders, chilled water systems, compressed air systems, nitrogen systems, etc., shall be factory installed and connected as shown on the drawings or specified herein.
3. Each sink unit shall be factory plumbed for field connection of required services at the back or end of the unit; see plans for specific locations.
4. All faucets and control bodies, shall be heavy-duty brass except those dedicated to de-ionized water and/or chemicals, which shall be polyvinyl chloride.
5. All connecting piping shall be heavy-duty copper.
6. All plumbing shall be factory tested at 100 psi hydrostatic pressure.

2.8 SINK UNIT STAINLESS STEEL

A. General:

1. Factory finished units manufactured of 16 gauge 316L stainless steel developed especially to resist the corrosive effects of rapid fixers, color bleaches, iron chlorides, and other chemicals required in photographic and graphic arts processing. Inside bottom of the sink pan is to be dimpled to promote water circulation and drainage. Inside and outside corner to be $\frac{3}{4}$ in. radius coved corners for cleanliness and safety.
2. The stainless steel sinks shall be heli-arc welded into a one-piece fabrication using highly polished materials to produce smooth homogeneous surface with radius inside corners.
3. Sink bottom shall be undercoated to ensure condensation control and sound deadening while supporting processing trays and tanks in level position.
4. Remove traces of materials, which may be toxic or incompatible with other building materials.
5. Each unit shall be prepared for installation on a knockdown stand to facilitate quick assembly and disassembly for installation. Bases shall be constructed of 16-gauge 316L stainless steel.
6. Factory Plumbing
 - a. Plumbing: Each sink unit shall be factory plumbed as shown on the drawings or specified herein.

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- b. All faucets, valves, spouts, vacuum breakers, circulation systems, temperature blenders, chilled water systems, compressed air systems, nitrogen systems, etc., shall be factory installed and connected as shown on the drawings or specified herein.
- c. Each sink unit shall be factory plumbed for field connection of required services at the back or end of the unit; see plans for specific locations.
- d. All faucets and control bodies shall be heavy-duty brass except those dedicated to de-ionized water and/or chemicals, which shall be polyvinyl chloride.
- e. All connecting piping shall be heavy-duty copper. All plumbing shall be factory tested at 100-psi hydrostatic pressure

2.9 ELECTRICAL SERVICE FIXTURES

- A. Service Fixtures: Provide factory wired and connected units complete with metal housing or box: necessary receptacles, terminals, switches, pilot lights, device plates: and fitting and gaskets required for mounting on casework. All fixtures shall be UL tested and listed. Comply with Division 16 electrical requirements.

2.10 FUME VENTILATION FIXTURES

- A. Local Fume Ventilation Fixtures: Provide fume extraction with versatile extractor arm system with a 3 in. tube diameter. System consists of white polypropylene arms and joints. Provide wall bracket and 15 in. diameter clean plastic collection hood. Requires 75 to 100 CMF, as specified elsewhere.

2.11 DARKROOM DOORS

- A. Revolving Darkroom Doors: Provide a 72 in. ADA approved 'pop out' design darkroom doors **and threshold ramps**. Doors consist of a rotating inner supported by a stationary outer cylinder. The inner cylinder rotates on a single sealed thrust ball bearing mounted in a steel U channel. Formed steel channels and flanges on either side of the door strengthen the outer cylinder. A U-shaped track at the bottom of the door guides the inner cylinder and prevents light and dust from infiltrating the darkroom.
 - 1. Inner and outer door cylinders shall be constructed of 0.10 in. thick black "Lustran", a rigid acrylonitrile butadiene styrene. The cylinder material is a petroleum hydrocarbon with a flash point of 730-752 degrees and has a flame class rating of UL-94 HB.
 - 2. All corrosion treated steel components are coated with Capital Flat Black number X12-55 to reduce the reflection of stray light.
 - 3. Flooring: The floor is constructed of 3/4 in. plywood and covered with a black rubber non-skid mat.

SECTION 11470 – PHOTOGRAPHY EQUIPMENT

4. Safety Hardware: The “Snap Free” breakaway system consists of mated aluminum 'J' channels with a black neoprene gasket connecting them. The smaller of the two channels is factory installed on the door flange. The second, larger channel is field installed on the wall around the door.
5. Internal Handrail: Operation of the door from the inside is facilitated by means of the aluminum handrail.
6. Provide luminescent fluorescent markers easy location in the dark when the door is rotated.
7. Flooring: Provide a black rubber non-slip mat standard with the manufacturer..
8. External Finger Grips: Operation of the door from the outside is facilitated by means of recessed finger grips in the rotating inner cylinder.
9. Acceptable Manufacturer: Provide ~~one of~~ the following :
 - a. ~~“Easy thru 300 JCH 32” (Consolidated Doors Corp.).~~
 - a.** “ABS S3W72” (Eseco).
 - e.b.** Or approved equal by **Kreolab, Inc. or Sebastian Darkroom Products.**

2.12 SILVER RECOVERY SYSTEMS

- A. Silver Recovery Systems: Ion exchange system shall be used in situations in which processing effluents contain relatively low levels of fixer and/or bleach-fix. This system includes the holding tank above in addition to the in-line ion exchange cells for reduction of silver tailings to 5% or better when maintained according to manufacturer’s recommendations.

2.13 PHOTOGRAPHY EQUIPMENT SCHEDULE

- A. Products specified herein as a basis of design are from Kreolab Inc. establish the quality standards required, or approved equal.
- B. The following photography equipment schedule requires reference to the interior elevations on Drawing Sheet A-611:

TAG QTY MODEL NO. MANUF ITEM DESCRIPTION

ELEVATION 15

| | | | |
|------|---|------------|---|
| PE-1 | 1 | STD25/0800 | KREOLAB COUNTERTOP W/ BACKSPLASH |
| PE-2 | 1 | BF36/9 | KREOLAB BASE FILLER |
| PE-3 | 2 | BD243624 | KREOLAB BASE CABINET, DOOR, TWO ADJ. SHELVES |
| PE-4 | 2 | LKSMD-1 | KREOLAB LOCK, SINGLE, MASTER KEYED |
| PE-5 | 5 | EWS36KDD | KREOLAB ENLARGING STATIONS, SAFELIGHT, DRAWERS (Keyed to master key) |
| PE-6 | 1 | KAPA-1 | KREOLAB DARKROOM IN USE LIGHT |

SECTION 11470 – PHOTOGRAPHY EQUIPMENT

PE-7 1 FDALTK-36 Fd'A LIGHTPROOFING SEAL KIT

ELEVATION 16

PE-8 1 2W54 ESECO TWO-WAY REVOLVING DARKROOM DOOR

PE-9 1 RAMPS-54 ESECO RAMPS FOR WHEELCHAIR ACCESS

ELEVATION 17

PE-10 1 FE2000W Fd'A FUME EVACUATOR SYSTEM

PE-11 1 KCS/0510 KREOLAB CHEMICAL STORAGE SHELF

PE-12 1 2024SB KREOLAB PRINT SQUEEGEE BOARD

PE-13 1 1745E1SH KREOLAB FIBERGLASS TRAY SINK W/ FIXTURES ON
ADA STAND

PE-14 1 EYEWASH Fd'A EYEWASH, INSTALLED ON SINK FIXTURE

PE-15 1 STD25/0360 KREOLAB COUNTERTOP W/ BACKSPLASH

PE-16 1 BDO363623 KREOLAB OPEN BASE CABINET, PRINT DRYING

PE-17 1 RCFS3623 KREOLAB PRINT DRYING SCREENS W/ CHANNELS 8ea

PE-18 1 RFD20-36 KREOLAB ROLL FILM DRYER

PE-19 1 EWS36KDH KREOLAB ENLARGING STATION, SHELF, WHEELCHAIR
ACCESS

PE-20 4 EWS36KDD KREOLAB ENLARGING STATIONS, SAFELIGHT,
DRAWERS (Keyed to master key)

PE-21 1 STD17/0780 KREOLAB COUNTERTOP W/BACKSPLASH

PE-22 2 ENDSPL/R KREOLAB ENDSPLASH LEFT/RIGHT

PE-23 2 LP3416 KREOLAB COUNTERTOP SUPPORT PANEL

ELEVATION 18

PE-24 1 KAPA-1 KREOLAB DARKROOM IN USE LIGHT

PE-25 1 FDALTK-36 Fd'A LIGHTPROOFING SEAL KIT

PE-26 1 STD25/1560x KREOLAB COUNTERTOP W/ BACKSPLASH

PE-27 1 KFJ KREOLAB COUNTERTOP FIELD JOINT

PE-28 1 ENDSPL/R KREOLAB ENDSPLASH LEFT/RIGHT

PE-29 1 BF36/9 KREOLAB BASE FILLER

PE-30 2 BD303624 KREOLAB BASE CABINET, TWO DOOR, TWO ADJ.
SHELVES

PE-31 3 LKDDM-1 KREOLAB LOCK, DOUBLE, MASTER KEYED

PE-32 1 BD363624 KREOLAB BASE CABINET, TWO DOOR, TWO ADJ.
SHELVES

PE-33 1 BF36/5 KREOLAB BASE FILLER

PE-34 1 BC36 KREOLAB BASE CORNER

ELEVATION 19

PE-35 4 DUB THOMAS SAFELIGHT, SUPER DUPLEX, B&W

PE-36 1 WASV9 Fd'A WALKAROUND ISLAND SLOTTED VENT

PE-37 1 4295ESE1SH KREOLAB FIBERGLASS ISLAND SINK W/ FIXTURES ON
ADA STAND (Cut out right side of fixtures)

PE-38 1 EYEWASH Fd'A EYEWASH, INSTALLED ON SINK FIXTURE

PE-39 1 KTS4 KREOLAB VERTICAL TRAY STORAGE RACK

PE-40 1 MTS-2 Fd'A SILVER SOLUTION RECOVERY SYSTEM

SECTION 11470 – PHOTOGRAPHY EQUIPMENT

PART 3 - EXECUTION

3.1 GENERAL

- A. **Manufacturer's Instructions:** Prepare substrates, and install the work of this Section, including equipment, components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 EXAMINATION

- A. **Verification of Conditions:** Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
 - 1. Verify locations of concealed framing, blocking, reinforcements, and furring that support equipment by accurate field measurements before being enclosed. Record measurements on final shop drawings.
 - 2. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that photography equipment can be supported and installed as indicated.

3.3 PREPARATION

- A. **Substrate Acceptability:** Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. **Coordination:** Coordinate photography equipment with the adjacent work of other sections. Provide items to be placed during the installation of other work at the proper time to avoid delays. Coordinate placement of such items, including inserts and anchors, accurately in relation to the final location of photography equipment.

3.4 INSTALLATION

- A. Coordinate installation with the work of other trades to ensure exact fit and perfect alignment. Verify dimensions before proceeding and obtain measurements at job site for work required to be accurately fitted to other construction. Install work plumb, level, true and straight with no distortions. Provide shims as required. Cutting, trimming, fitting and matching of prefinished work will not be permitted. Where cutting is required, scribe to fit adjoining work so as not to damage finished surfaces.
- B. Securely fasten photography equipment items to blocking with concealed fasteners only. Where surface nailing is required, countersink and fill flush with the woodwork so that the finished heads are undetectable. Install materials utilizing materials and methods as recommended by manufacturer unless otherwise specified.

SECTION 11470 – PHOTOGRAPHY EQUIPMENT

- C. Service Fixtures And Accessories Installation: Service fixtures and accessories supplied and/or installed as a portion of this work shall be installed in a precise manner in accordance with manufacturers directions. Where connections are required to mechanical and electrical lines, the manufacturer is to provide items required for connection, and coordinate the final installation made by the other Contractors.

3.5 CASEWORK INSTALLATION

- A. Install plumb, level, true and straight with no distortions. Level with leveling legs or shim as required, using concealed shims. Where casework abuts other finished work, scribe and apply filler strips for accurate fit with fasteners concealed where practicable.
- B. Base Cabinets: Set cabinets straight, plumb and level. Adjust sub-tops within 1/16 in. of a single plane. Fasten each individual cabinet to floor at toe space, with fasteners spaced 24 in. o. c. Bolt continuous cabinets together. Secure individual cabinets with no less than 2 fasteners into floor, where they do not adjoin other cabinets.
- C. Where required, assemble units into one integral unit with joints flush, tight and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 in..
- D. Wall Cabinets: Securely fasten to solid supporting material, not plaster, lath or wallboard. Anchor, adjust and align wall cabinets as specified for base cabinets.
 - 1. Reinforcement of stud walls to support wall-mounted cabinets will be done during wall erection by trade involved, but responsibility for accurate location and sizing of reinforcement is part of this work.
- E. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.6 INSTALLATION OF TOPS

- A. Field Jointing: Where practical, make in same manner as factory-jointing using dowels, splines, and fasteners recommended by manufacturer. Locate field joints as shown on accepted shop drawings, factory prepared so there is no job site processing of top and edge surfaces.
- B. Fastenings: Use concealed clamping devices for field joints located within 6 in. of front, at back edges and at intervals not exceeding 24 in.. Tighten in accordance with manufacturer's instructions to exert a constant, heavy clamping pressure at joints. Secure tops to cabinets with "Z" type fasteners or equivalent, using 2 or more fasteners at each front, end and back.
- C. Workmanship: Abut top and edge surfaces in one true plane, with internal supports placed to prevent any deflection. Provide flush hairline joints in top units using clamping devices. At stone type material joints, use manufacturer's recommended adhesives and holding devices to provide joint widths not more than 1/16 in. wide at any location, completely filled and flush with abutting edges.
- D. After installation, carefully dress joints smooth, remove any surface scratches, clean and polish entire surface.

SECTION 11470 – PHOTOGRAPHY EQUIPMENT

- E. Provide scribe moldings for closures at junctures of top, curb and splash with walls as recommended by manufacturer for materials involved. Use chemical resistant, permanently elastic sealing compounded where recommended by manufacturer.

3.7 INSTALLATION OF PHOTOGRAPHIC DARKROOM DOORS

- A. Outer wall must be flat and have a surface that will hold finishing nails and/or screws that extend a minimum of 5 in. from the finished door opening.
- B. Substrate shall be flat and smooth where door is to installed. Doorway shall be level with the surrounding area on the light side of the door to permit operation of the “Snap Free” breakaway system.

3.8 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed upon completion of installation.
- B. Clean shop finished surfaces, touch-up required, and remove or refinish damaged or soiled areas, as acceptable to Owner.
- C. Protection: Advise Contractor of procedures and precautions of protection of materials and installed photograph equipment from damage by work of other trades.

END OF SECTION 11470



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #5 – Sketch SKE-001 (Revised Luminaire
Schedule)

9/17/12



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 520 South Burnt Mill Road
 Voorhees, New Jersey 08043
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 www.ceg-inc.net

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Professional Engineer

Michael Fichetto P. E.
 New Jersey P.E. No. 33798
 Signature & License No.

| No. | Description | Date |
|-----|-------------|----------|
| 1 | BULLETIN | 08-05-12 |

PROJECT TITLE
**ELIZABETH
 ACADEMIC HIGH
 SCHOOL**

SKETCH TITLE
**LUMINAIRE SCHEDULE
 REVISIONS**

DWG REF. NO.: E-009
 PROJ NO.: 1012139
 SCALE: NOT TO SCALE
 DWN BY: CM
 CHK BY: CM
 DATE: 2012-09-05

SKETCH NO:
SKE-001

| | | | | | | | |
|---|---|---|---|--|--|--|--|
| M | RECESSED LINEAR DIRECT WITH 2 LAMP CROSS SECTION AND WHITE LOUVER | MFR. PINNACLE ARCHITECTURAL LTG. CAT#: E4L-2T8-XX-FL-UNV-1C-W-PM | X | | | 2-32WATT T8 277V (CROSS SECTION) | REFER TO PLANS FOR APPROPRIATE FIXTURE LENGTHS TO BE UTILIZED. PROVIDE SEPARATE 4' SECTIONS AS DETAILED AND AS LOCATED ON PLAN FOR EMERGENCY LIGHTING. |
| N | SAME AS TYPE 'M' EXCEPT 1 LAMP CROSS SECTION. | MFR. PINNACLE ARCHITECTURAL LTG. CAT#: E4L-1T8-XX-FL-UNV-1C-W-PM | X | | | 1-32WATT T8 277V (CROSS SECTION) | REFER TO PLANS FOR APPROPRIATE FIXTURE LENGTHS TO BE UTILIZED. PROVIDE SEPARATE 4' SECTIONS AS DETAILED AND AS LOCATED ON PLAN FOR EMERGENCY LIGHTING. |



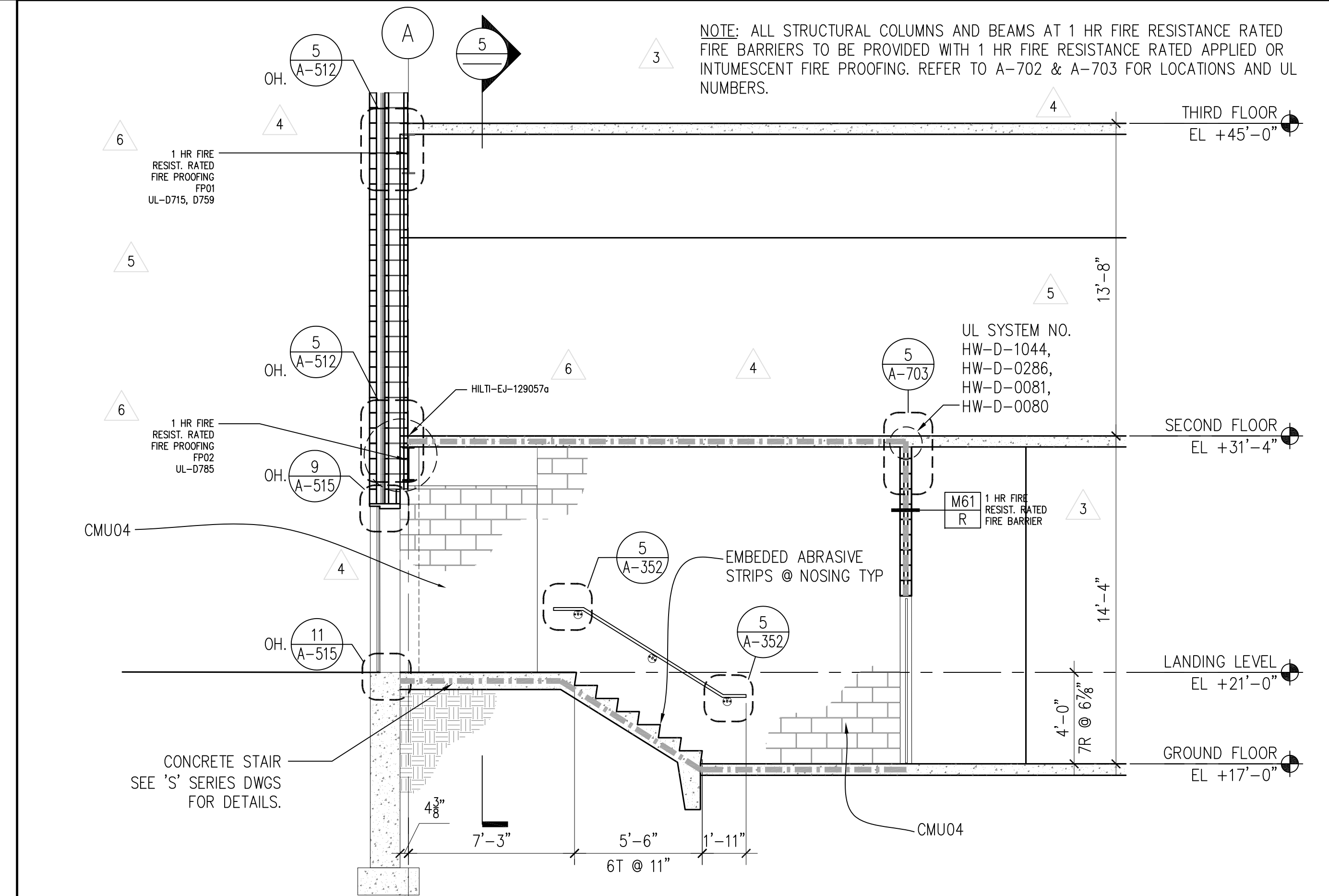
Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

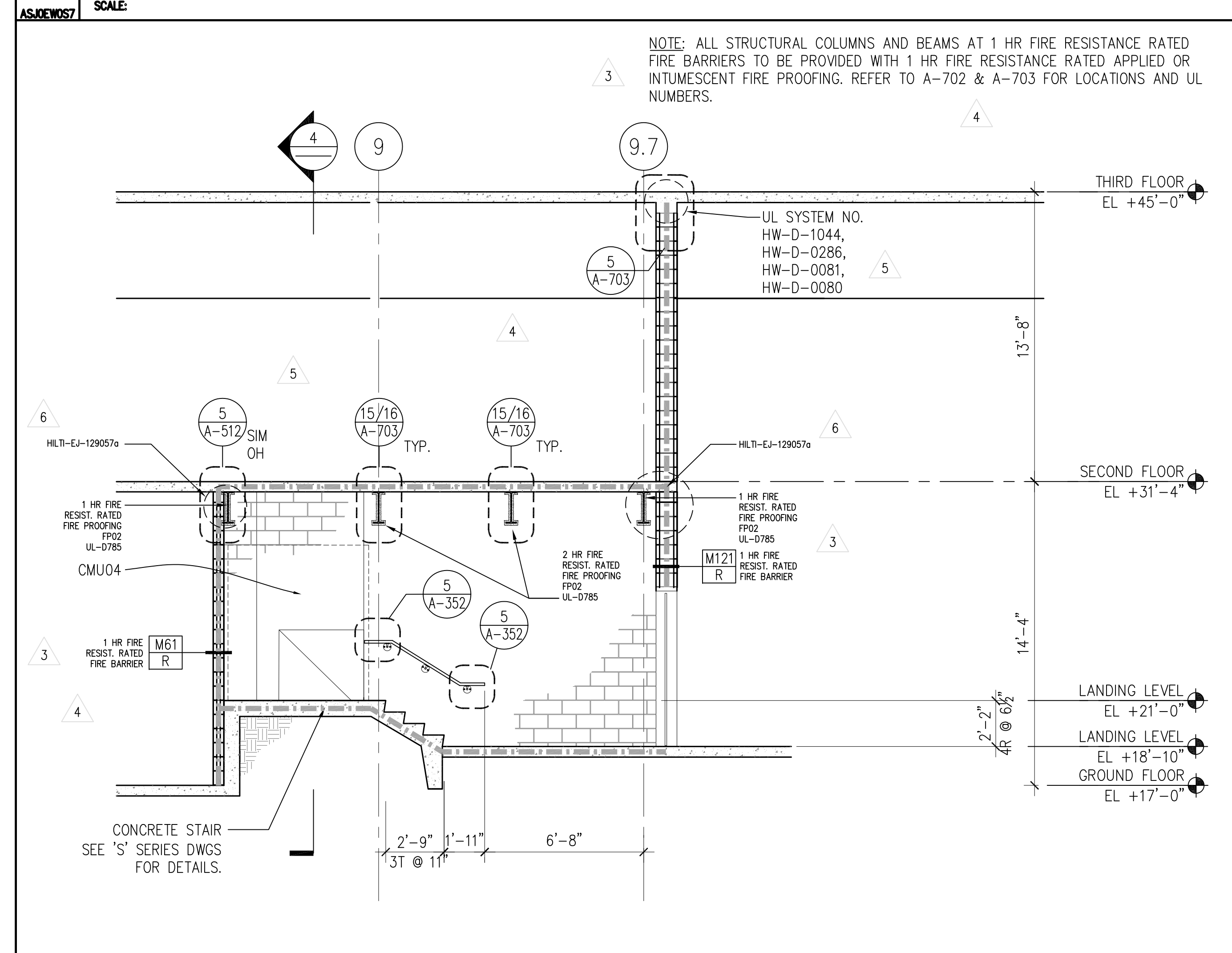
Addendum #5

Attachment #6 – Revised Drawing A-301

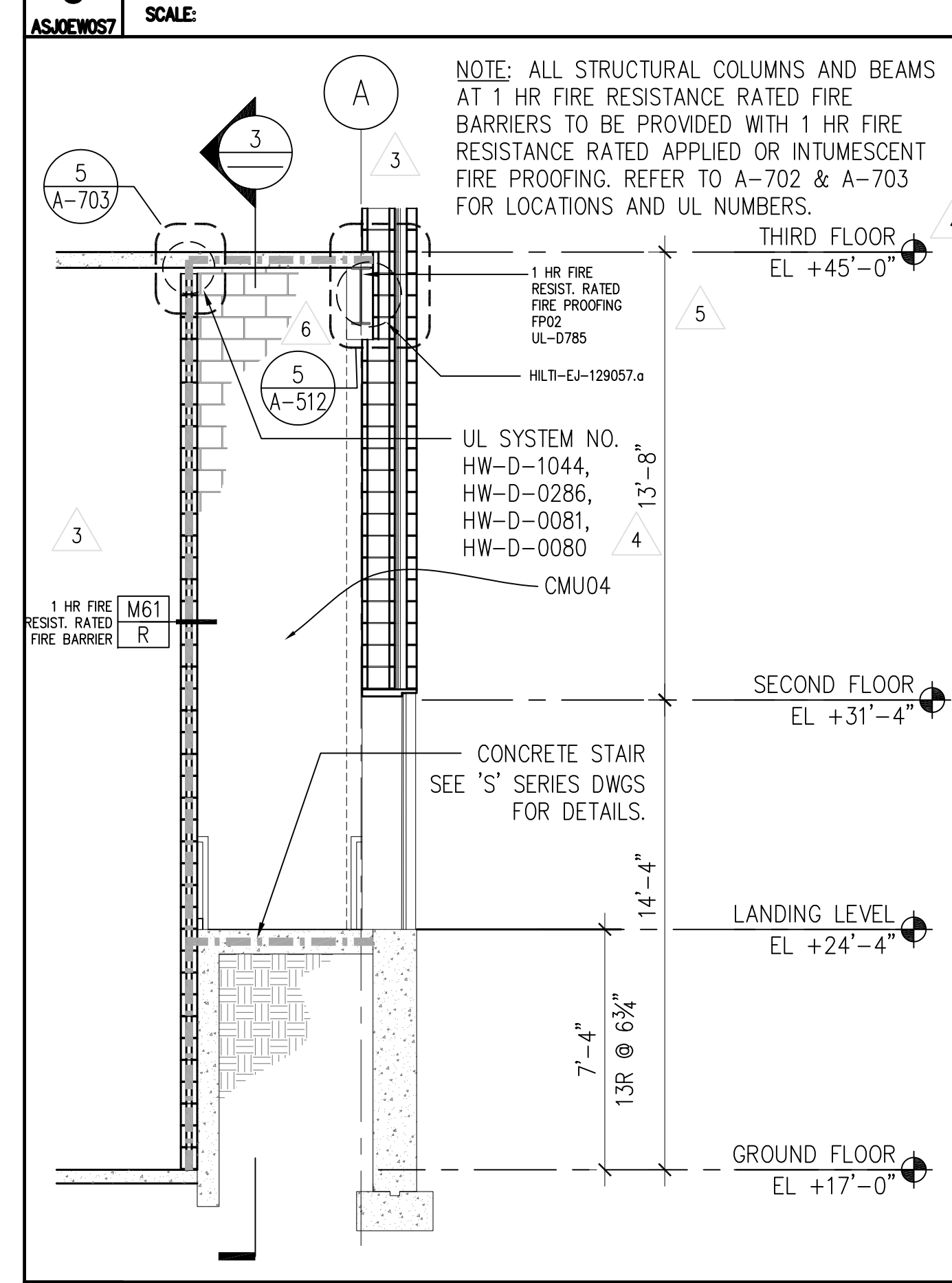
9/17/12



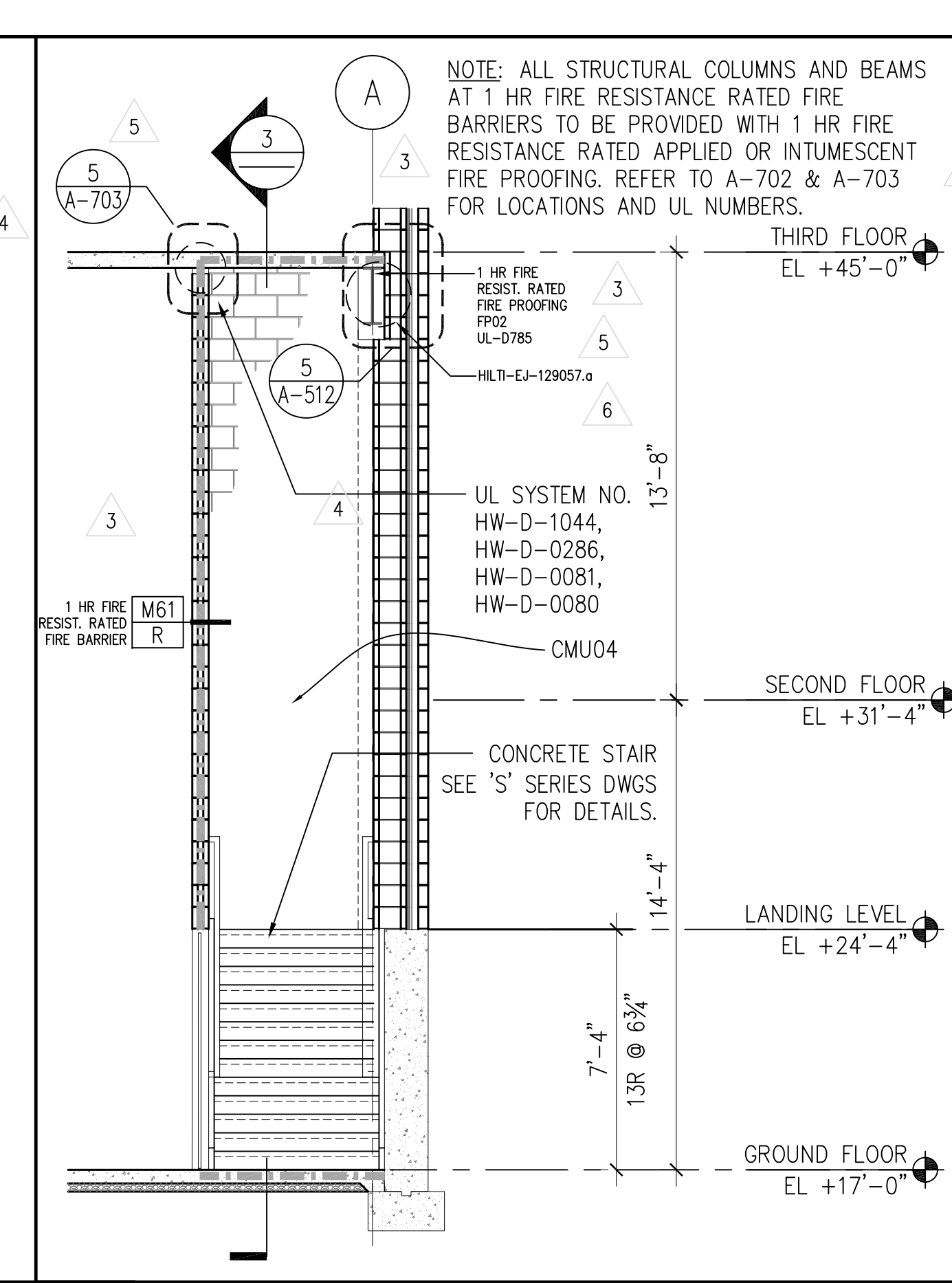
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SCALE: AS SHOWN



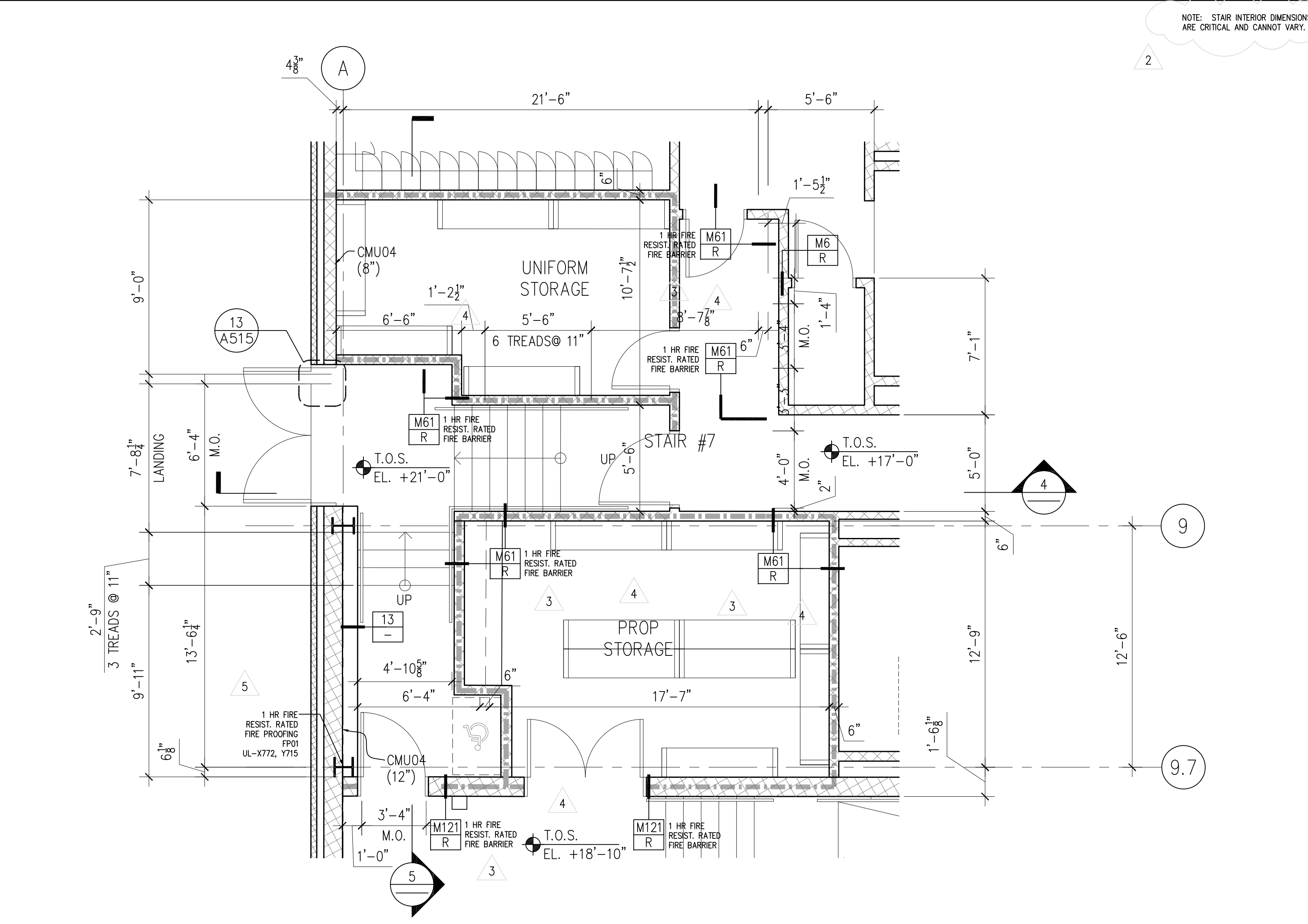
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SCALE: AS SHOWN



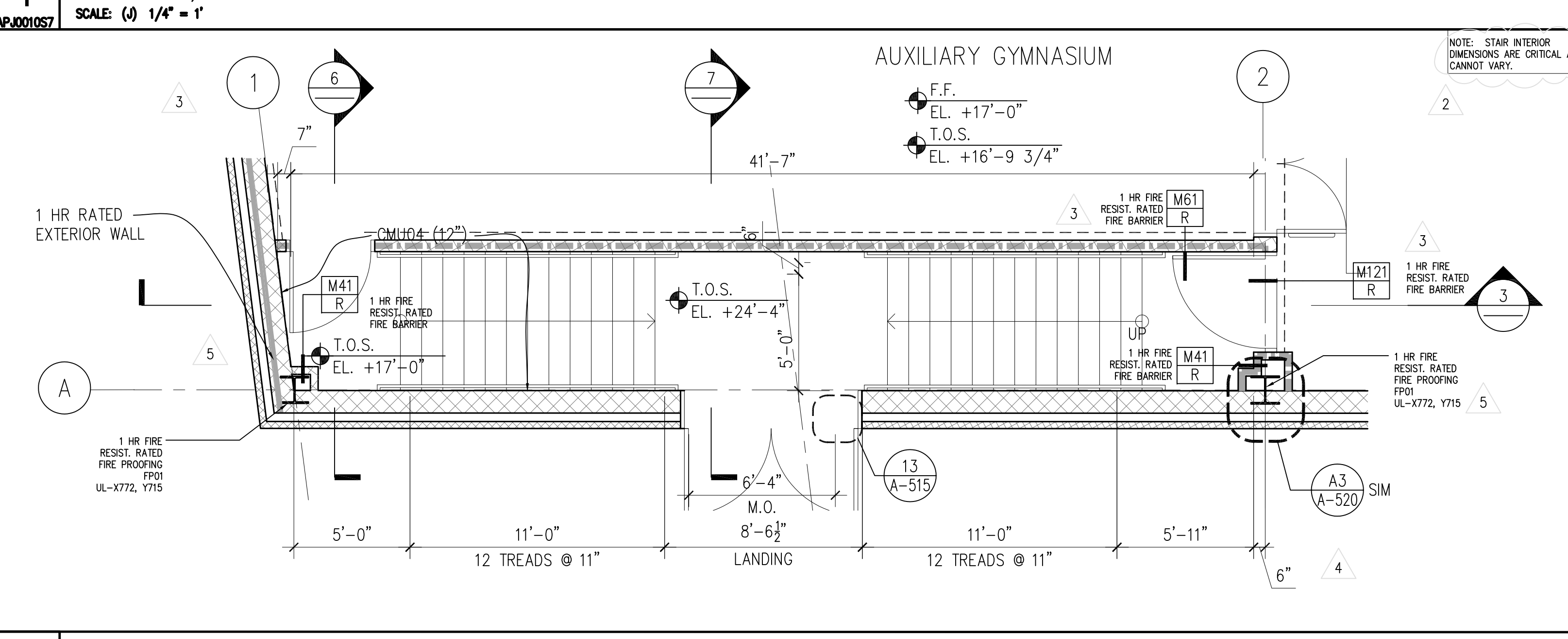
7 STAIR #5 SECTION NORTH-SOUTH
SCALE: AS SHOWN



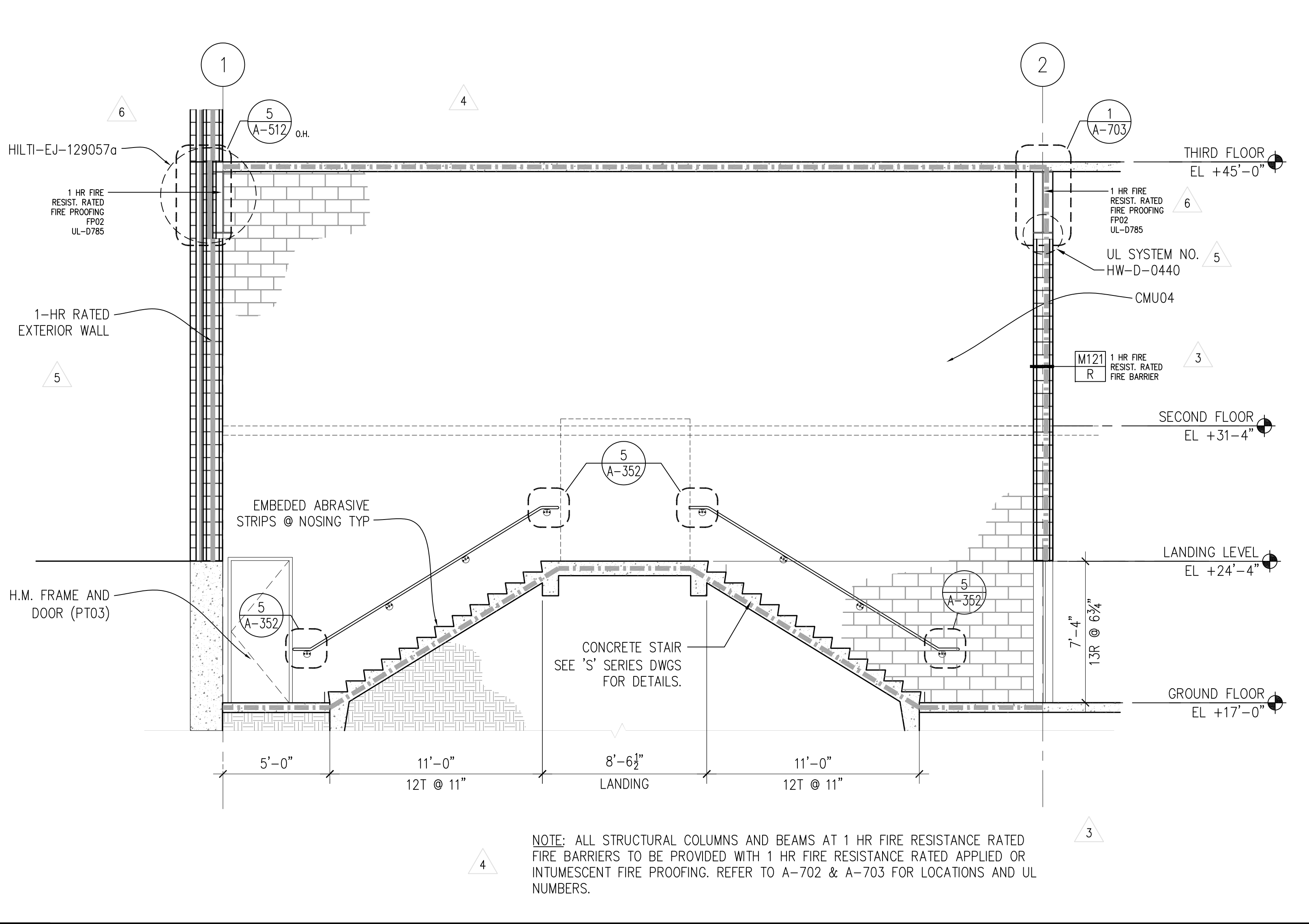
6 STAIR #5 SECTION NORTH-SOUTH @ DOOR
SCALE: AS SHOWN



1 STAIR #7, UNIFORM STORAGE AND PROP STORAGE - GROUND FLOOR
SCALE: (1) 1/4" = 1'



2 STAIR #5 - GROUND FLOOR
SCALE: (1) 1/4" = 1'



3 STAIR #5 SECTION
SCALE: (1) 1/4" = 1'

SDA
NJ Schools Development Authority

ELIZABETH ACADEMIC HIGH SCHOOL

Owner
State of New Jersey Schools Development Authority
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Plumbing and Fire Protection
Concord Engineering Group, Inc.
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Voorhees, NJ 08043
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Surveying and Civil Engineering
Langan Engineering
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Elmwood Park, NJ 07407
(201) 794-6900

Landscape Design
MKW & Associates
39 Park Avenue
Rutherford, NJ 07070
(201) 933-7809

Information Technology
Intertech Associates, Inc.
77-55 Schanck Road
Suite A-14
Freshkill, NJ 07728
(732) 431-4236

Food Service Consultants
Hopkins Food Service Specialists, Inc.
27 West 24th Street
New York, NY 10010
(301) 320-9200

Fire Protection and Life Safety
Code Consultants, Inc.
330 West 38th Street
New York, NY 10018
(212) 216-9596

North

Key Plan

2 SEP 12, 12 ISSUED FOR ADDENDUM #5
1 JUL 13, 12 ISSUED FOR BID

No. Date Issue

STAIR #5 & 7 PLANS & SECTIONS

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Scale:
1/4" = 1'-0"
SOM 20965
209065
A-301.dwg

A-301



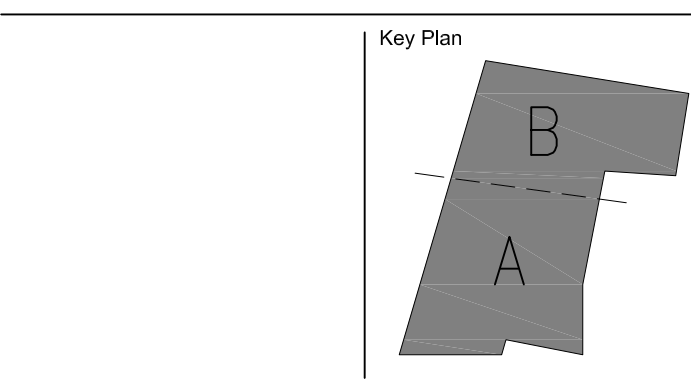
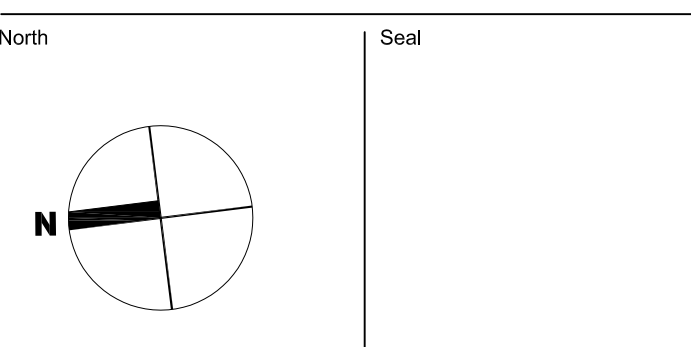
Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #7 – Revised Drawing A-302

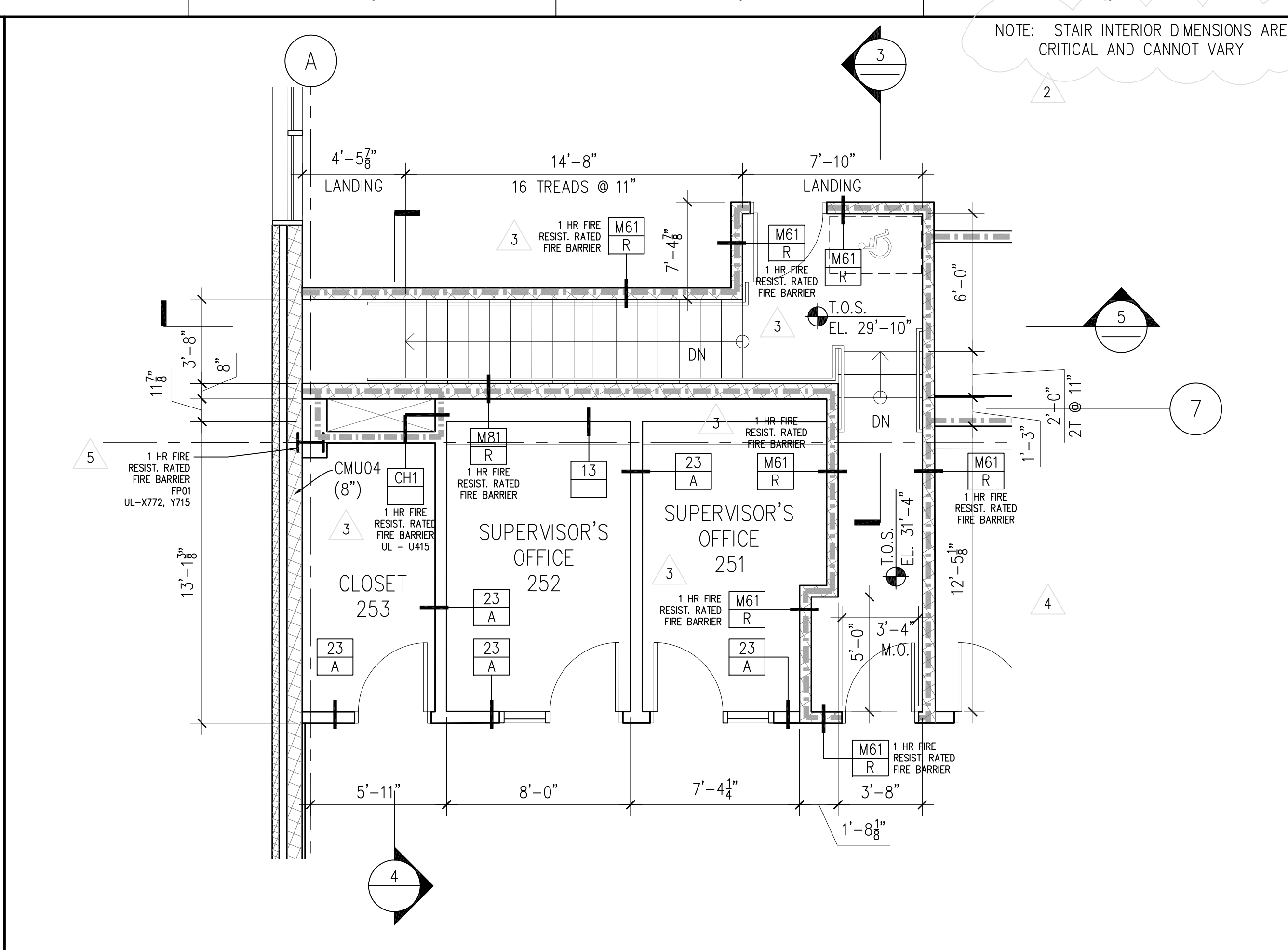
9/17/12



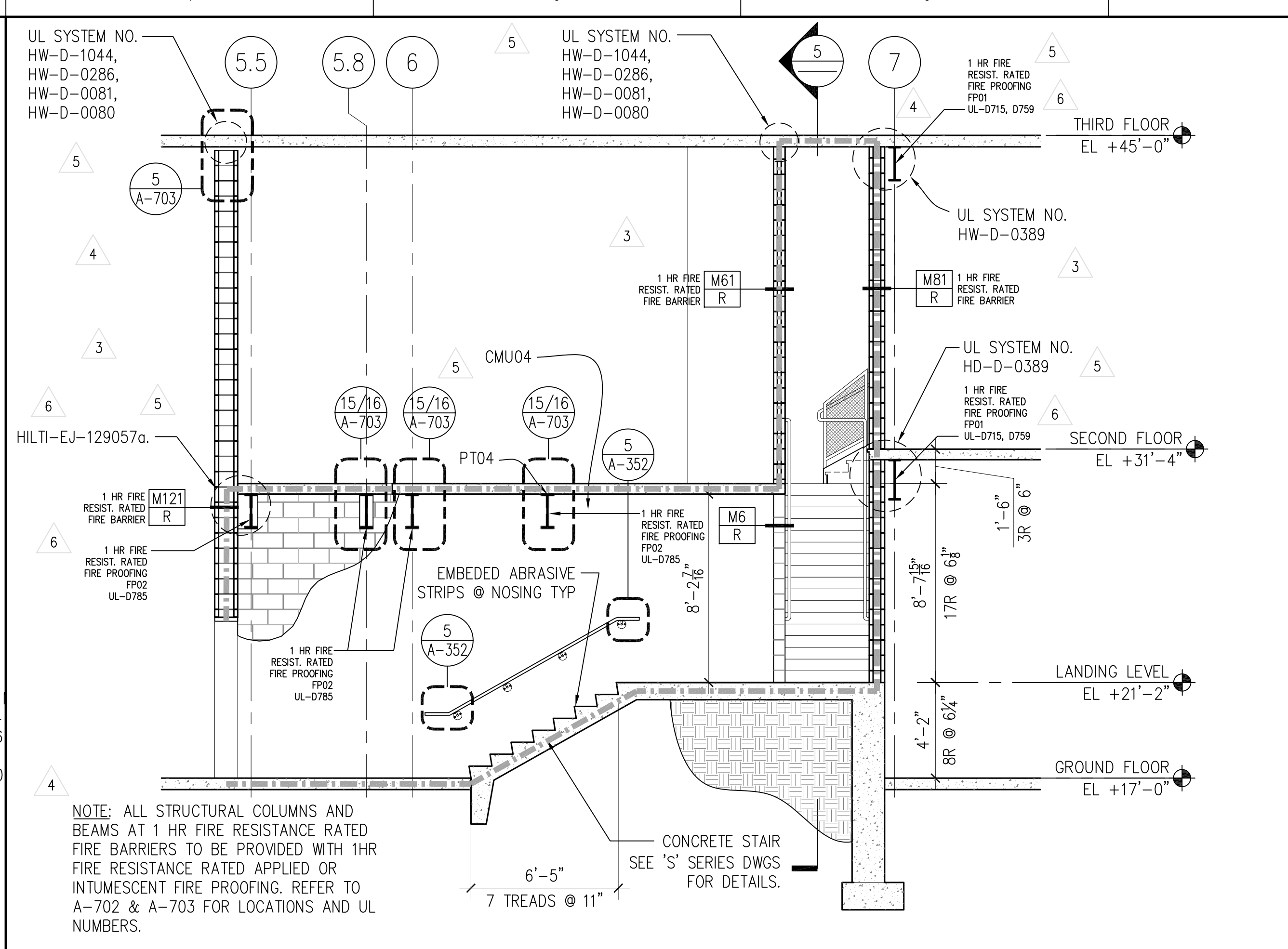
| No. | Date | Issue |
|-----|------------|------------------------|
| 2 | SEP 12, 12 | ISSUED FOR ADDENDUM #5 |
| 1 | JUL 13, 12 | ISSUED FOR BID |

**STAIR #6 PLANS
& SECTIONS**

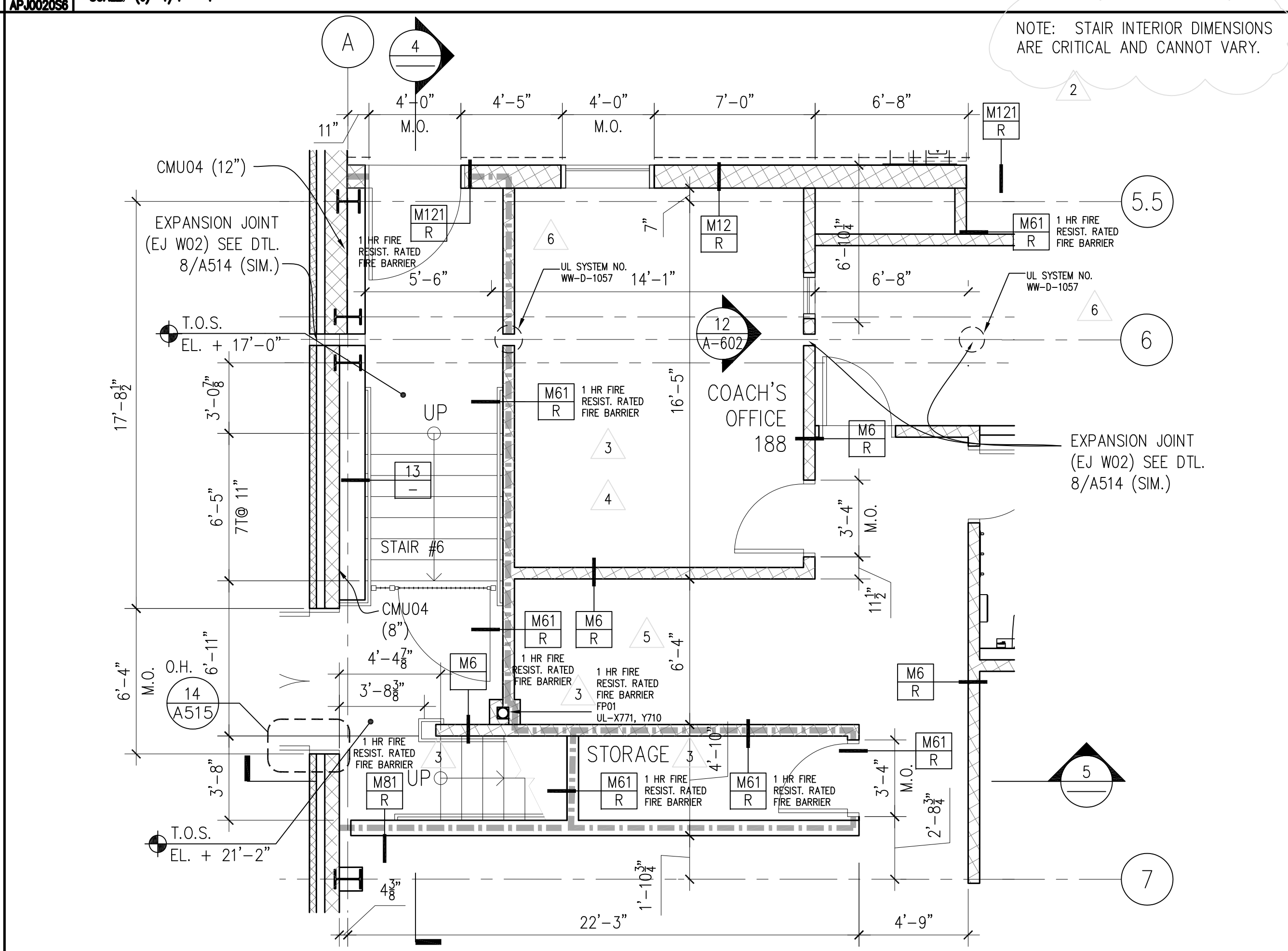
Copyright: Skidmore, Owings & Merrill Architects, LLP 2009
Scale:
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209065
209065
A-301.dwg



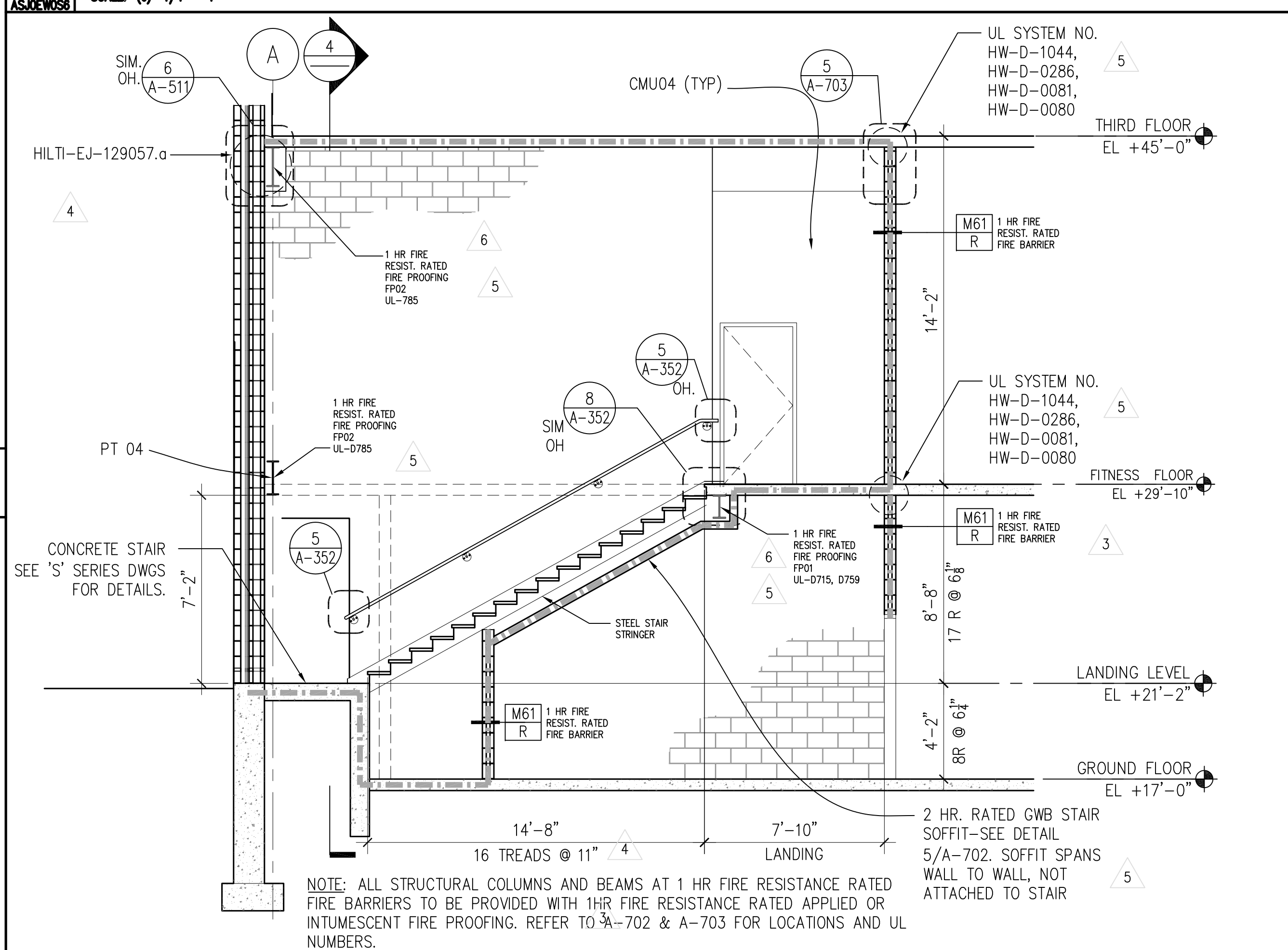
1 STAIR #6 AND OFFICES - SECOND FLOOR
SCALE: (A) 1/4" = 1'



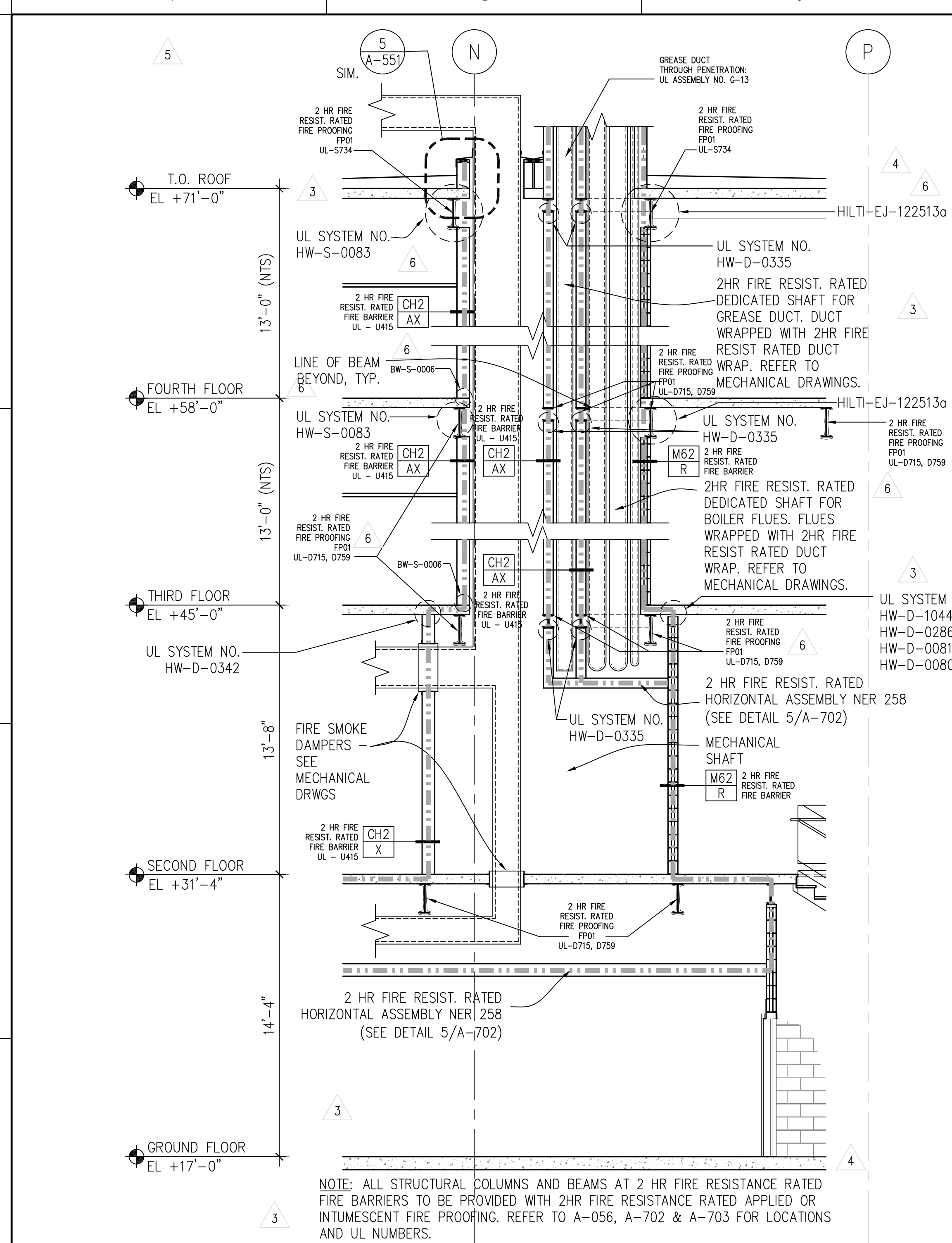
4 STAIR #6 SECTION EAST-WEST
SCALE: (A) 1/4" = 1'



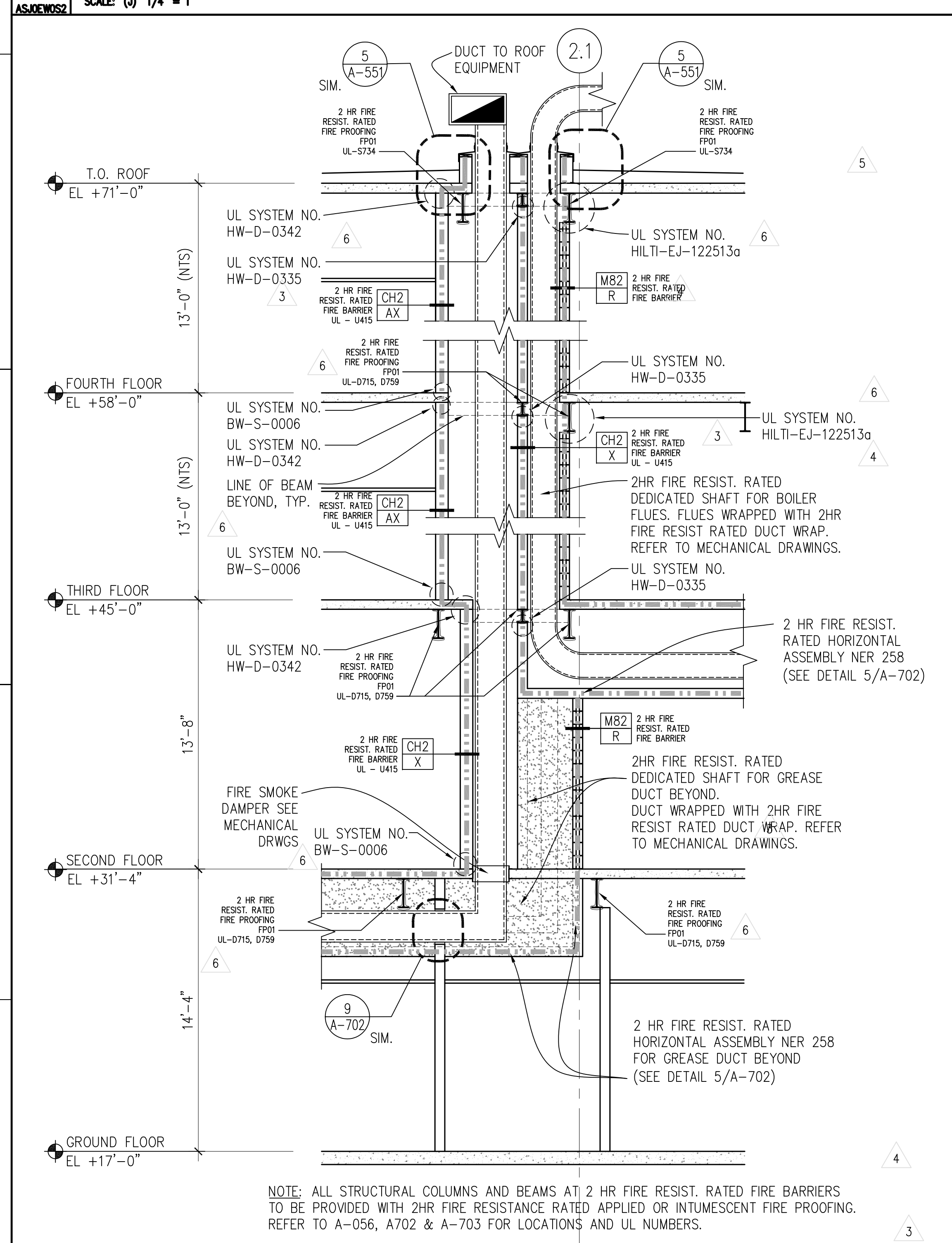
2 STAIR #6 AND COACH'S OFFICE - GROUND FLOOR
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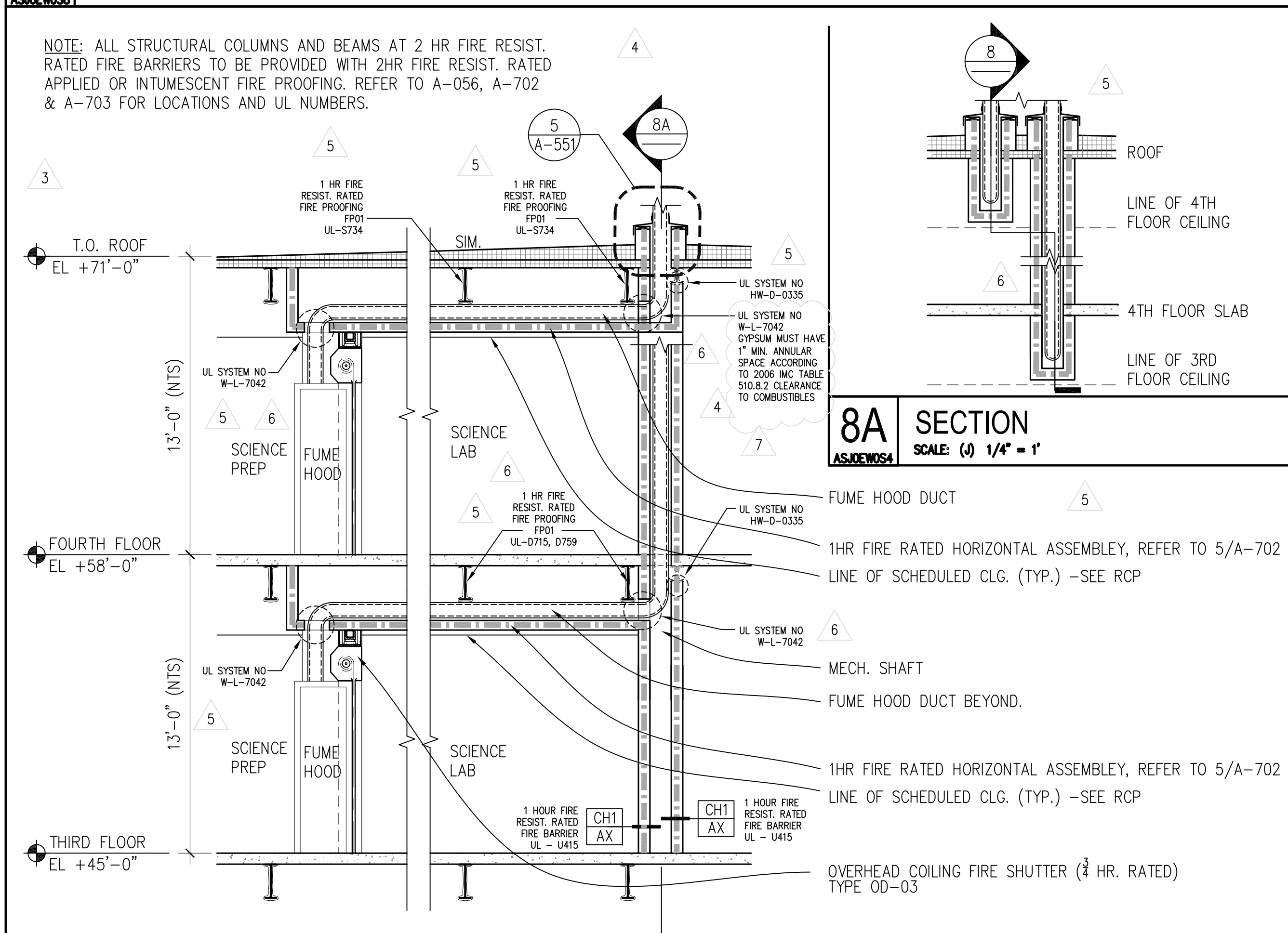
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SCALE: (A) 1/4" = 1'



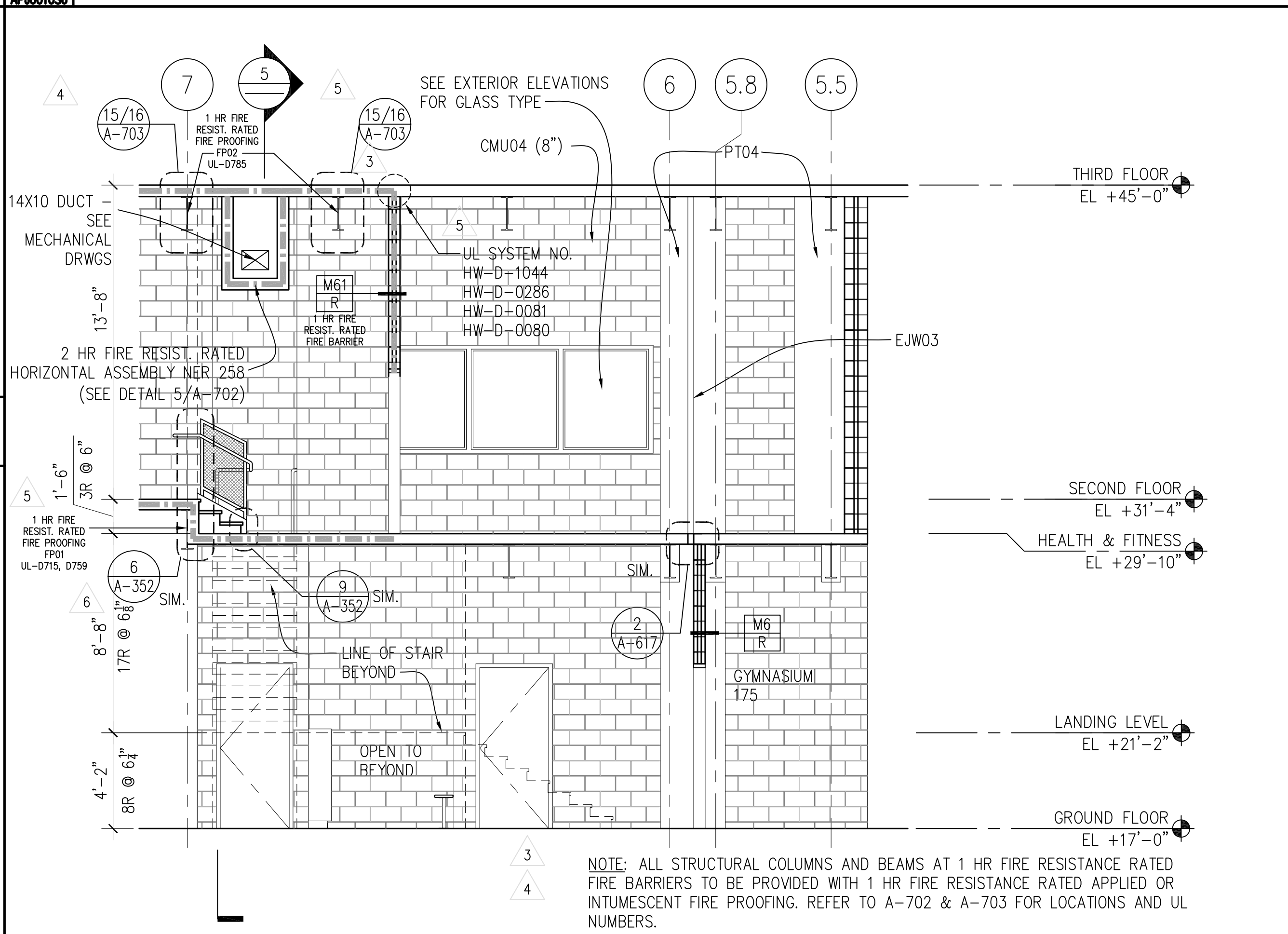
6 EAST - WEST SHAFT SECTION
SCALE: (A) 1/4" = 1'



7 NORTH - SOUTH SHAFT SECTION
SCALE: (A) 1/4" = 1'



8 SECTION THRU FUME HOOD EXHAUST
SCALE: (A) 1/4" = 1'



3 STAIR #6 SECTION @ INTERMEDIATE LANDING
SCALE: (A) 1/4" = 1'

NOTE: ALL STRUCTURAL COLUMNS AND BEAMS AT 2 HR FIRE RESIST. RATED FIRE BARRIERS TO BE PROVIDED WITH 2HR FIRE RESISTANCE RATED APPLIED OR INTUMESCENT FIRE PROOFING. REFER TO A-056, A-702 & A-703 FOR LOCATIONS AND UL NUMBERS.

NOTE: ALL STRUCTURAL COLUMNS AND BEAMS AT 1 HR FIRE RESISTANCE RATED FIRE BARRIERS TO BE PROVIDED WITH 1HR FIRE RESISTANCE RATED APPLIED OR INTUMESCENT FIRE PROOFING. REFER TO A-702 & A-703 FOR LOCATIONS AND UL NUMBERS.

NOTE: ALL STRUCTURAL COLUMNS AND BEAMS AT 1 HR FIRE RESISTANCE RATED FIRE BARRIERS TO BE PROVIDED WITH 1 HR FIRE RESISTANCE RATED APPLIED OR INTUMESCENT FIRE PROOFING. REFER TO A-702 & A-703 FOR LOCATIONS AND UL NUMBERS.



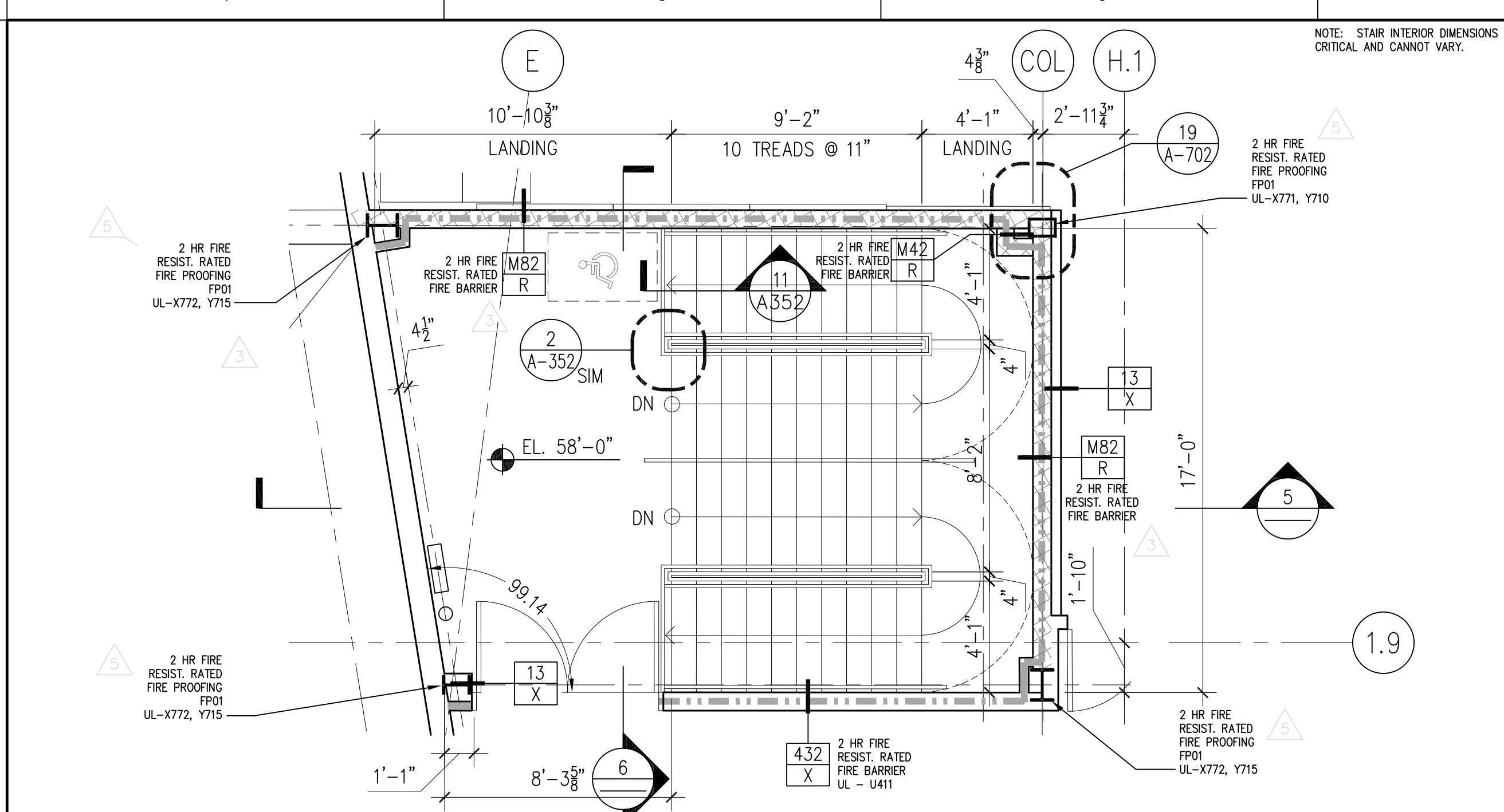
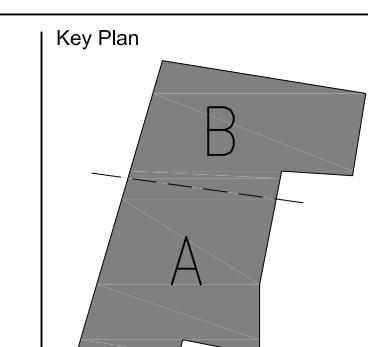
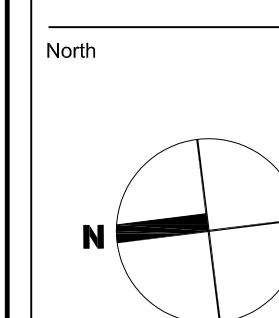
Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

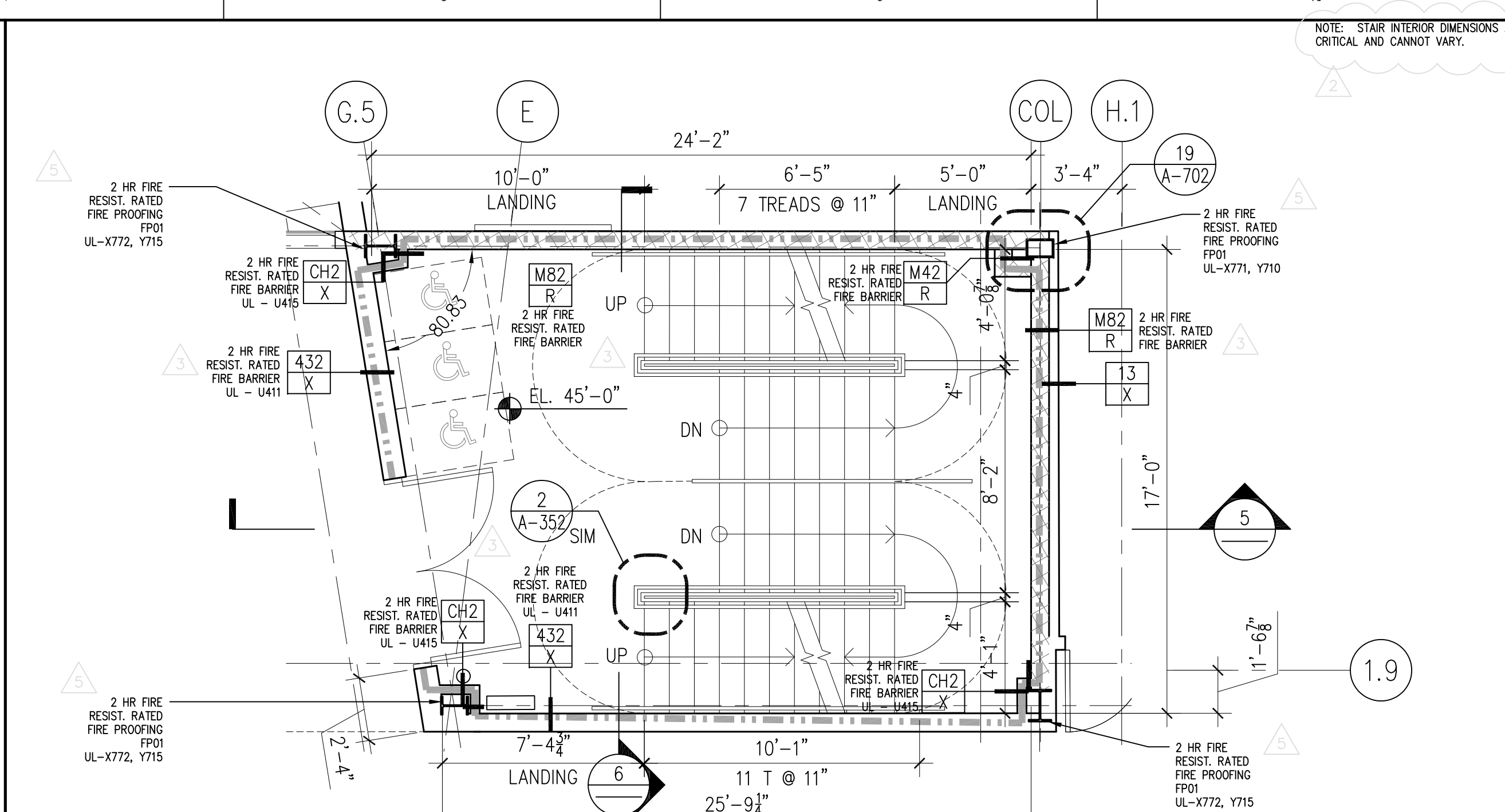
Addendum #5

Attachment #8 – Revised Drawing A-304

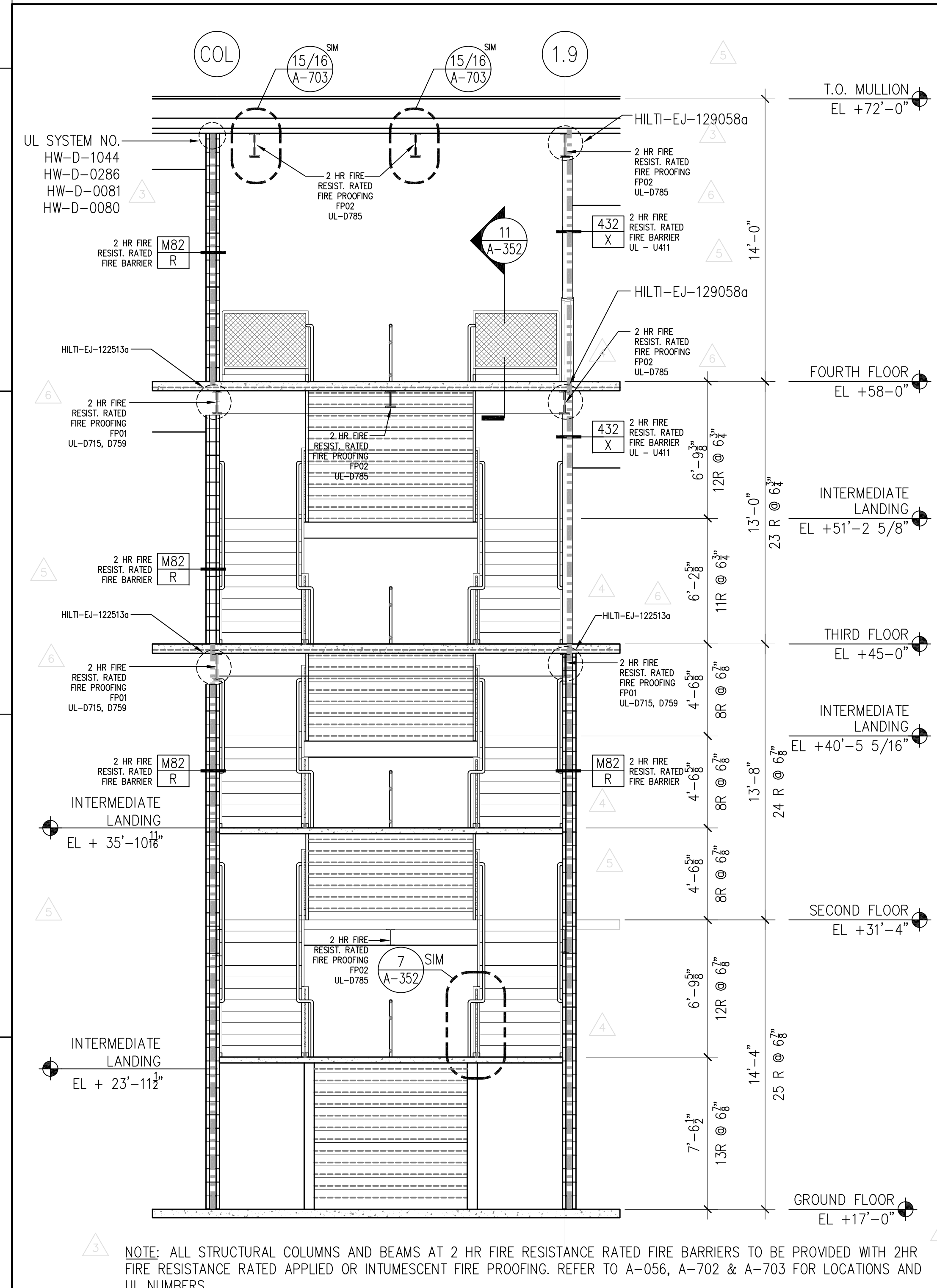
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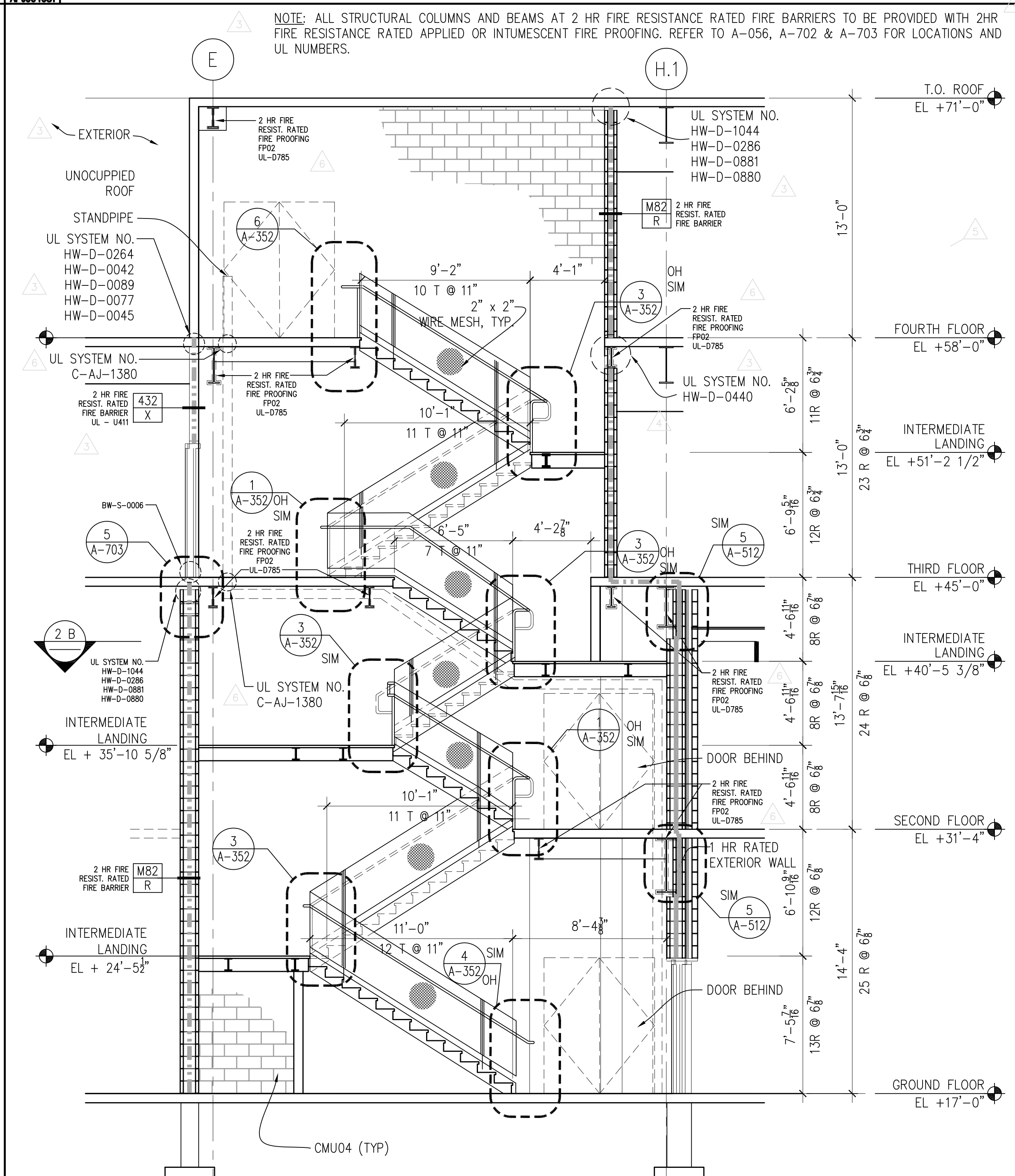
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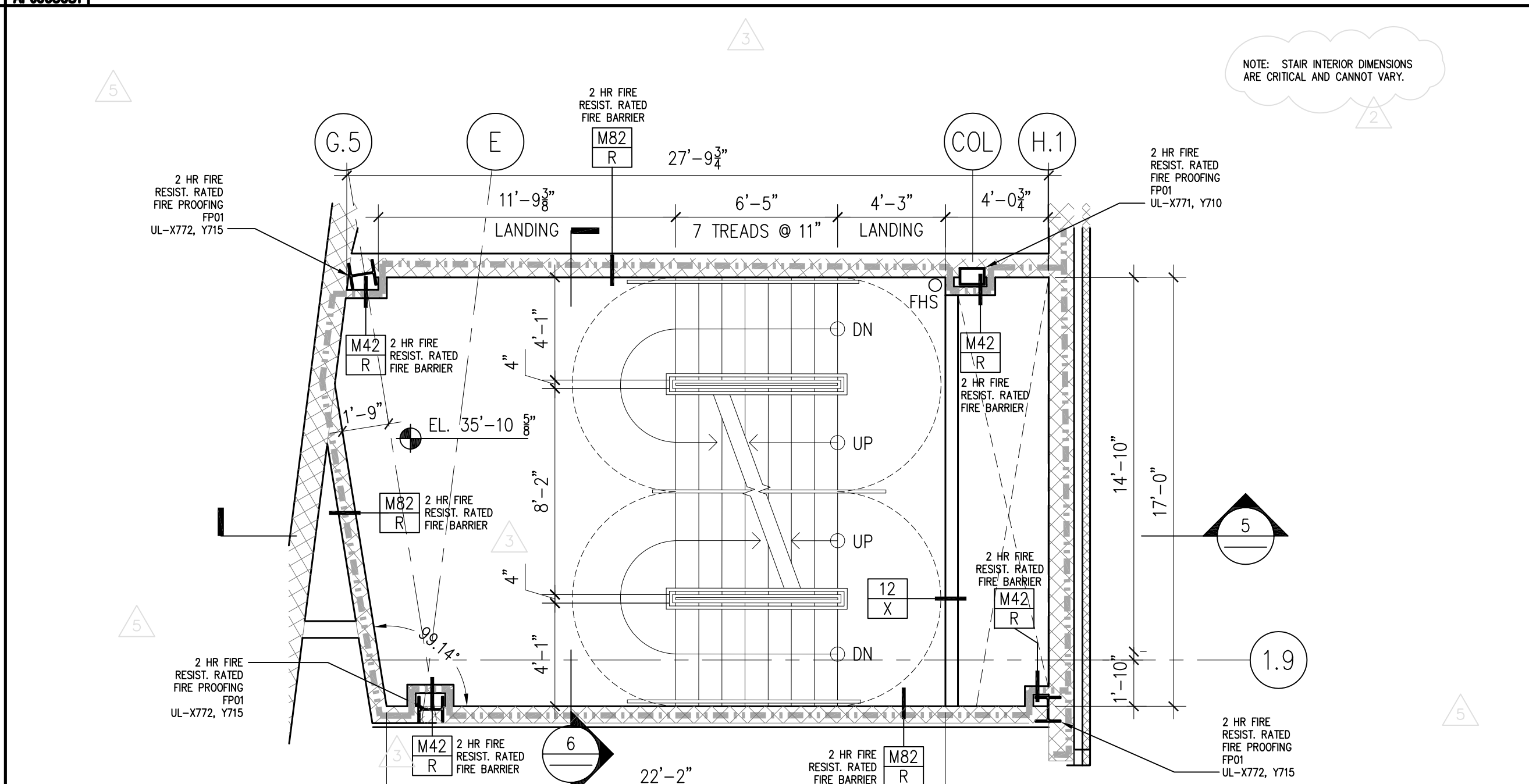
2 STAIR #1 - THIRD FLOOR
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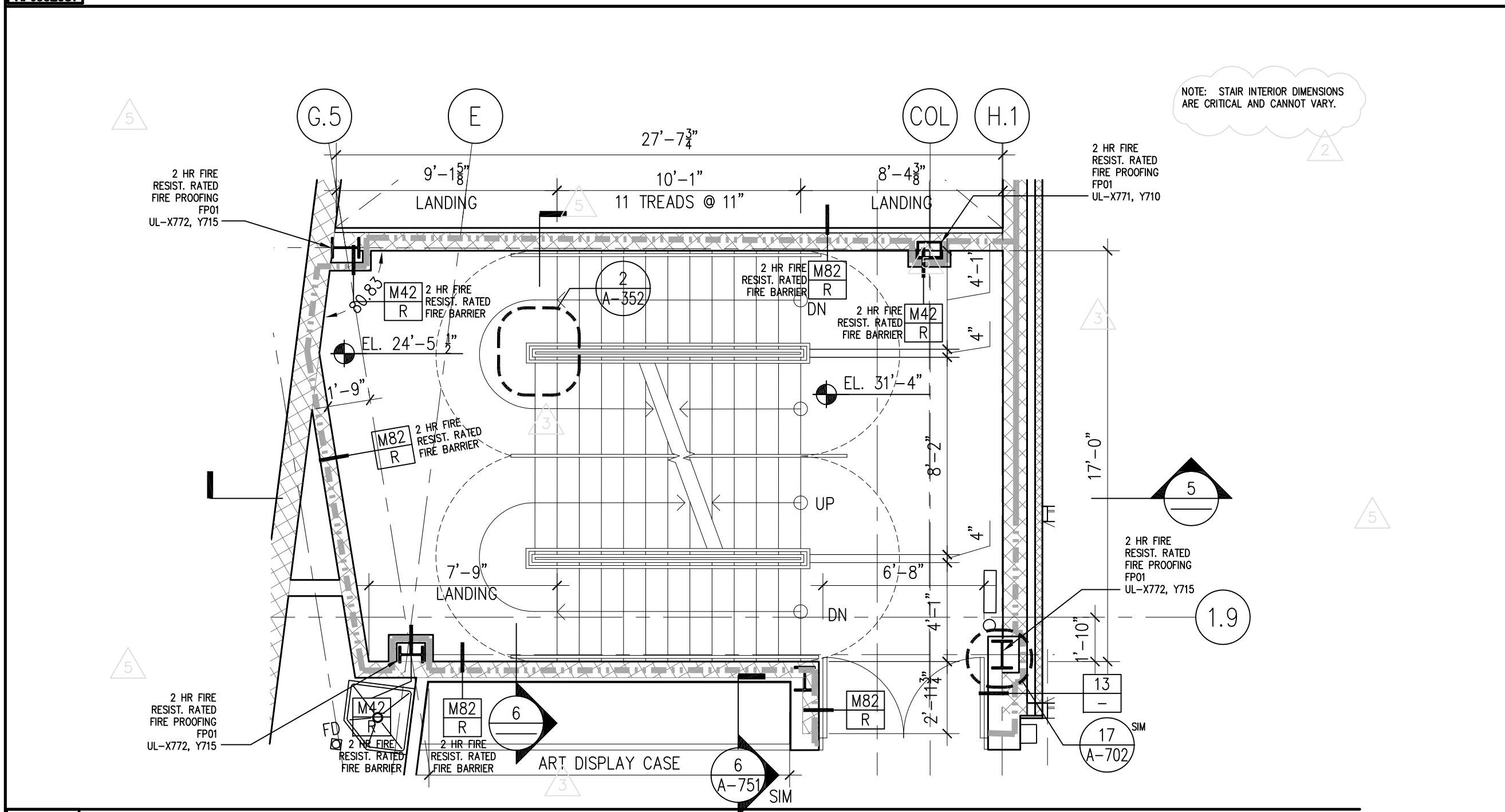
6 STAIR #1 SECTION
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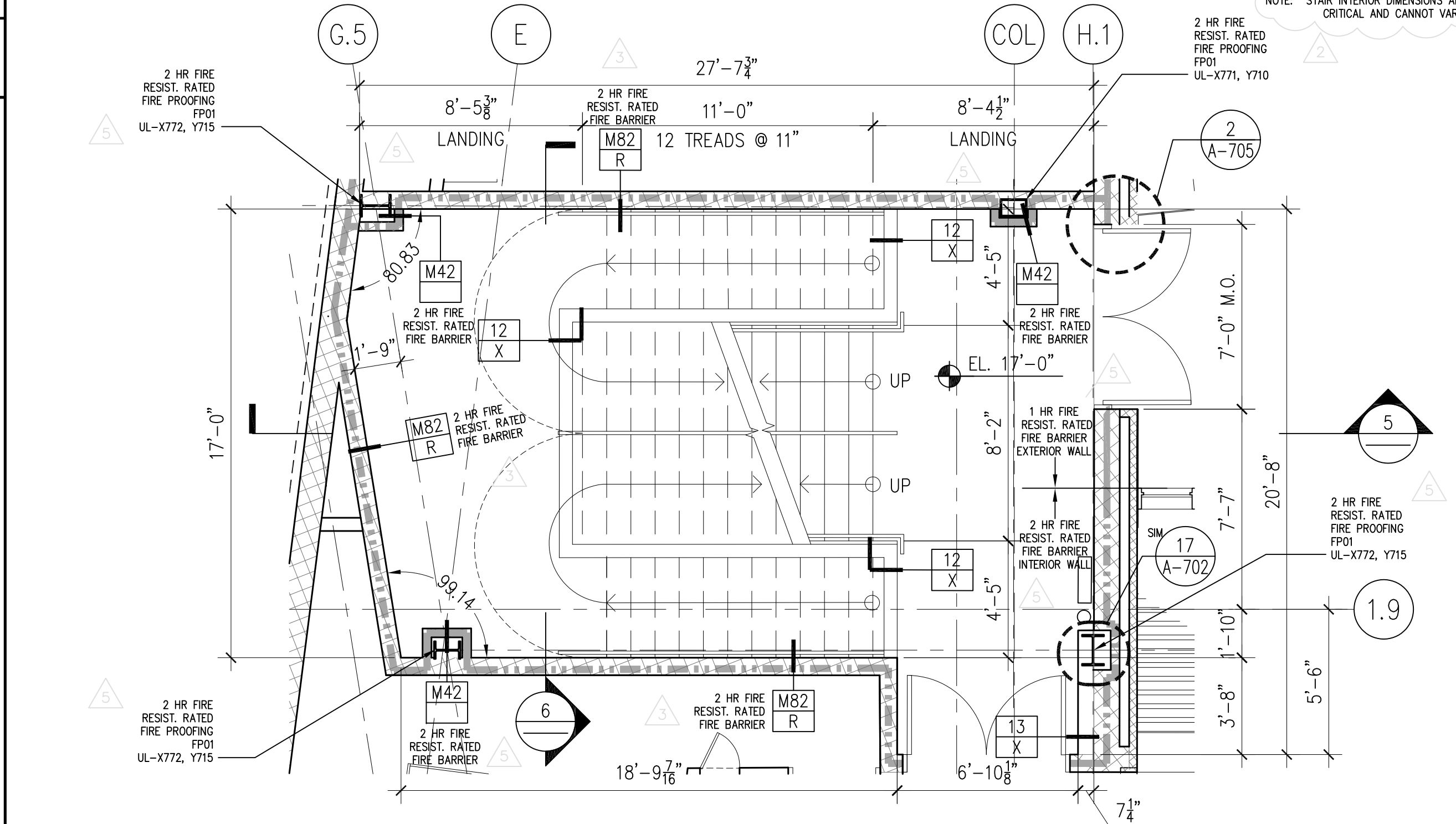
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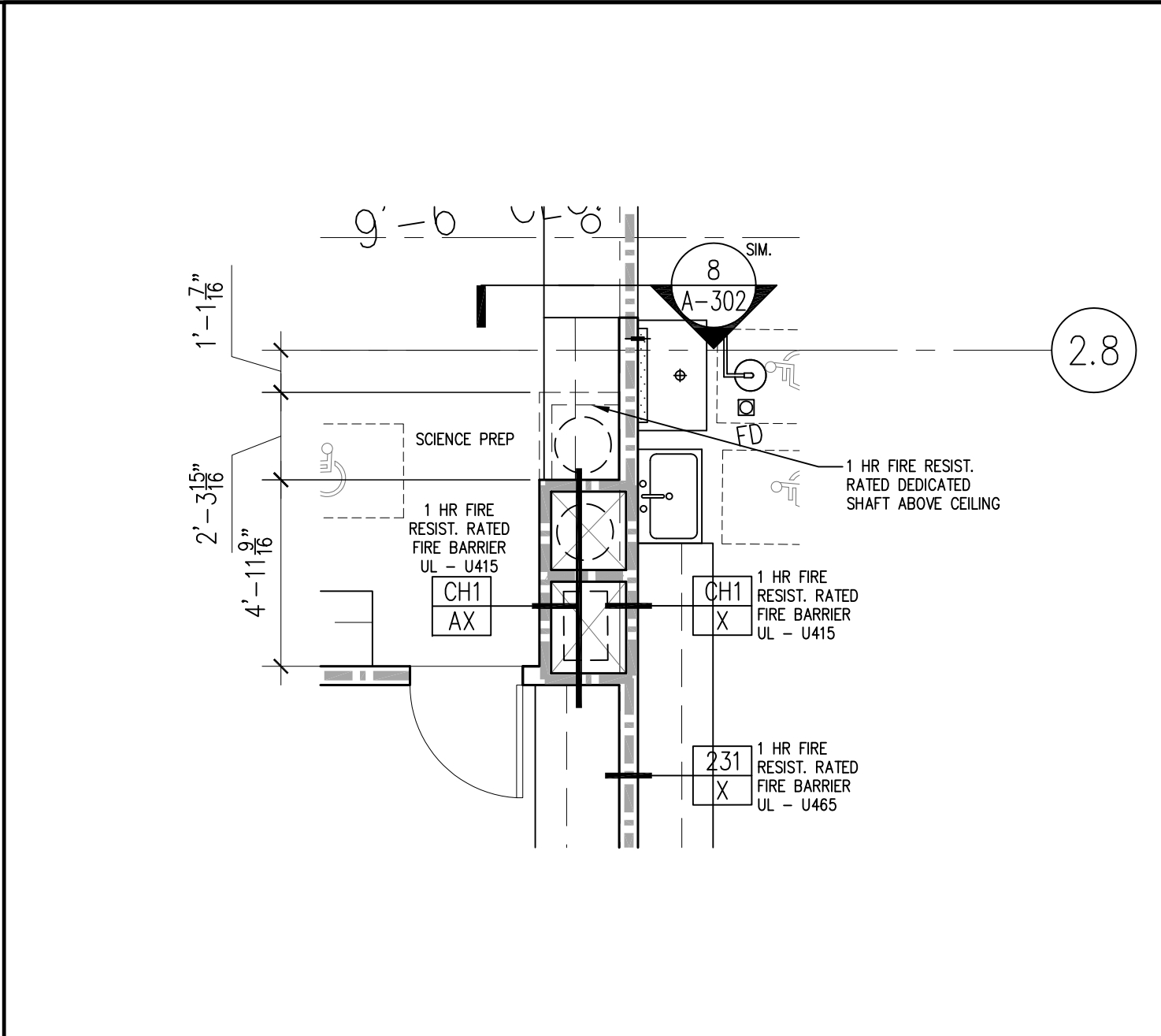
2B STAIR #1 - SECOND FLOOR - UPPER INTERMEDIATE LANDING
SCALE: (A) 1/4" = 1'



3 STAIR #1 - SECOND FLOOR
SCALE: (A) 1/4" = 1'



4 STAIR #1 - GROUND FLOOR
SCALE: (A) 1/4" = 1'



7 FOURTH FLOORPLAN AT FUME HOOD EXHAUST
SCALE: 1/4" = 1'-0"

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STAIR #1 PLANS & SECTIONS



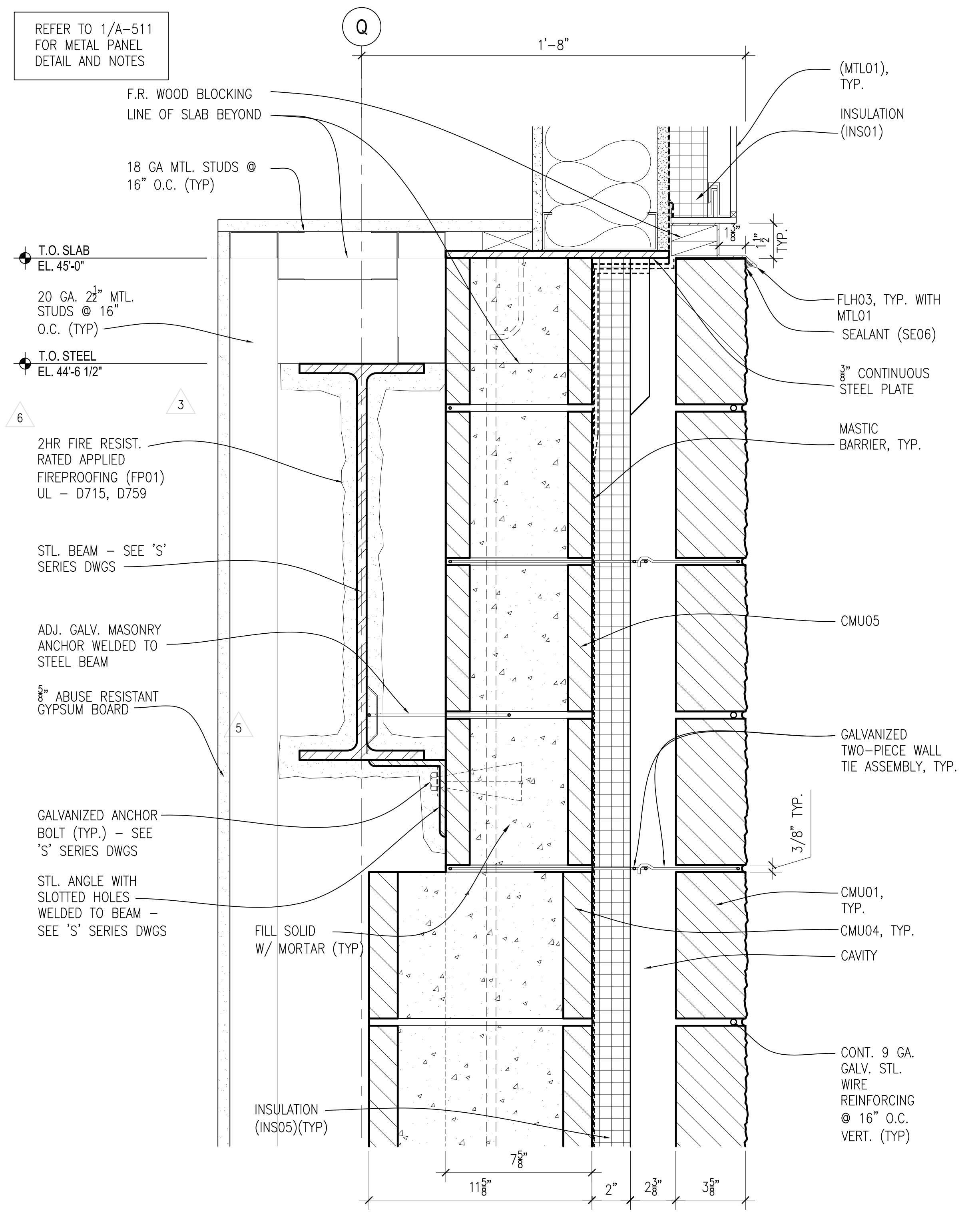
Elizabeth Academic High School
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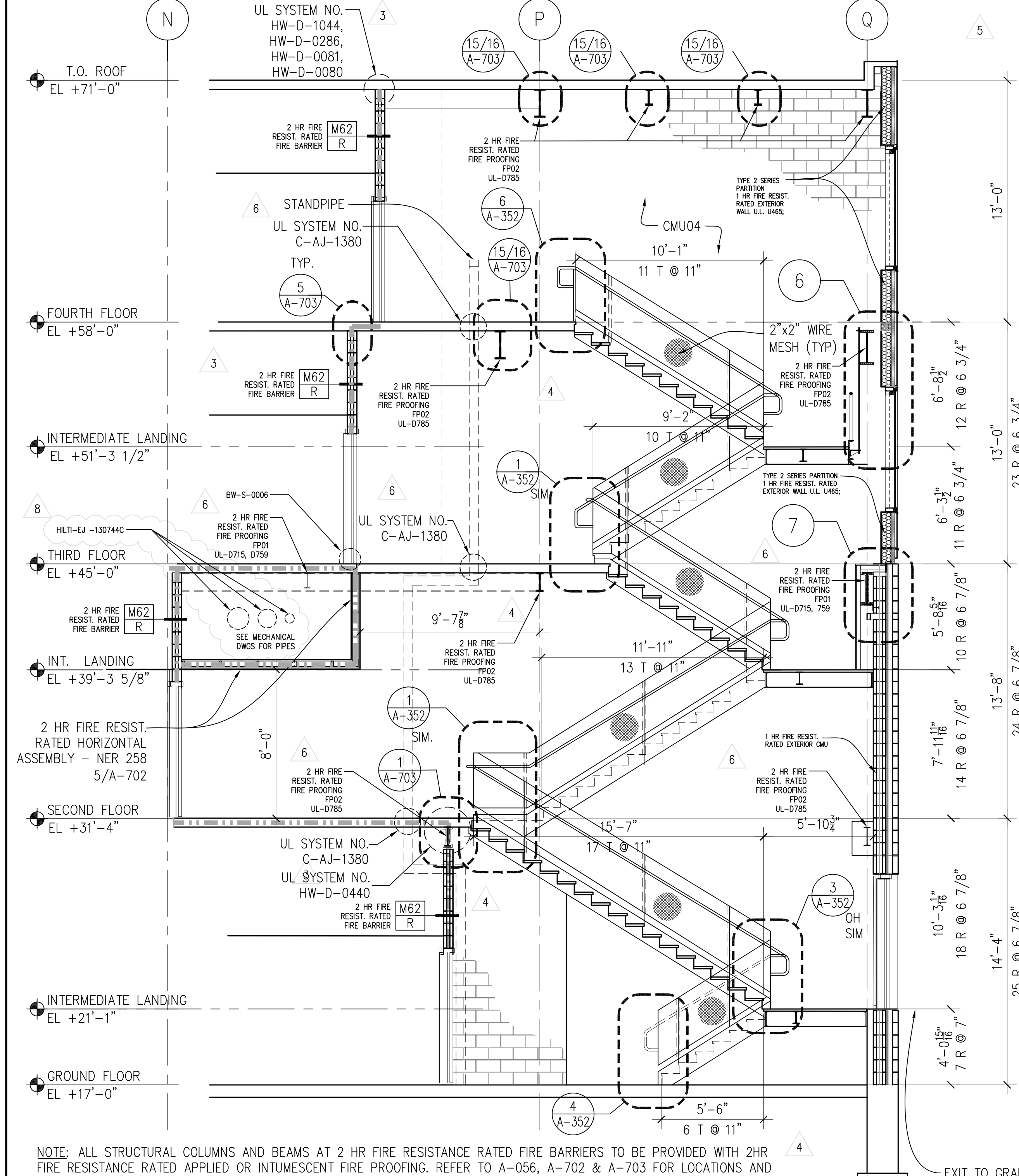
Addendum #5

Attachment #9 – Revised Drawing A-305

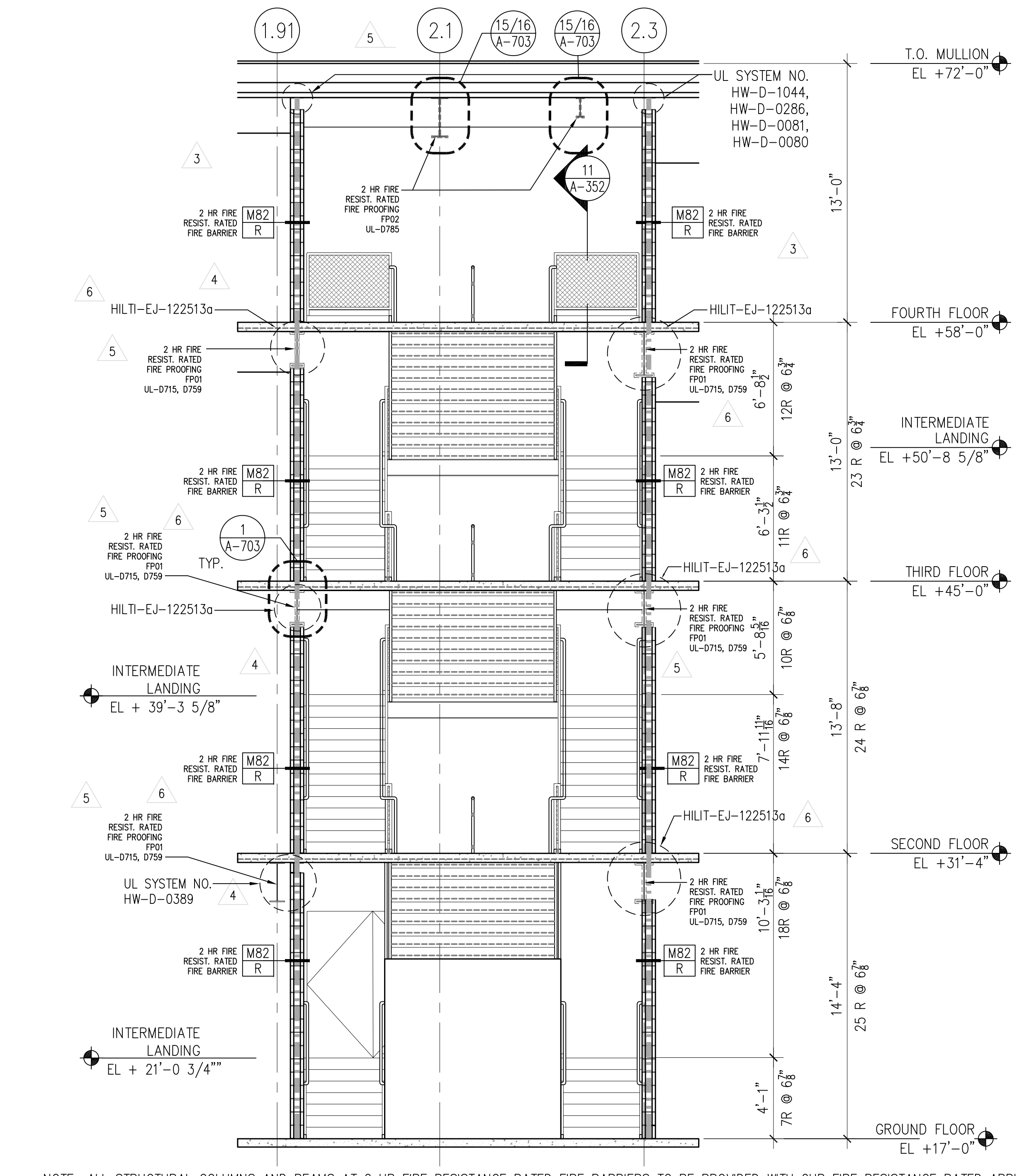
9/17/12



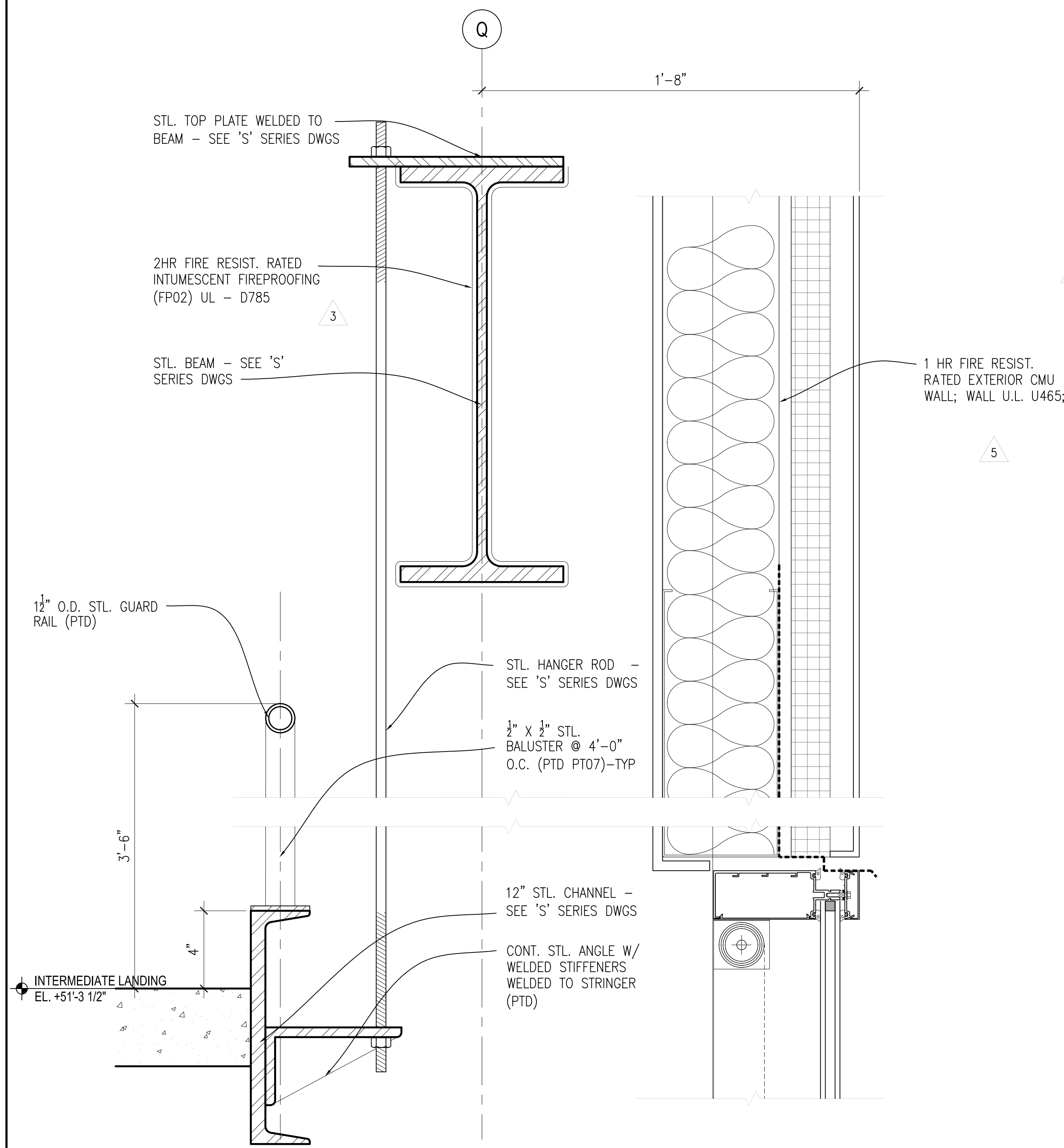
7 WALL DETAIL AT LANDING
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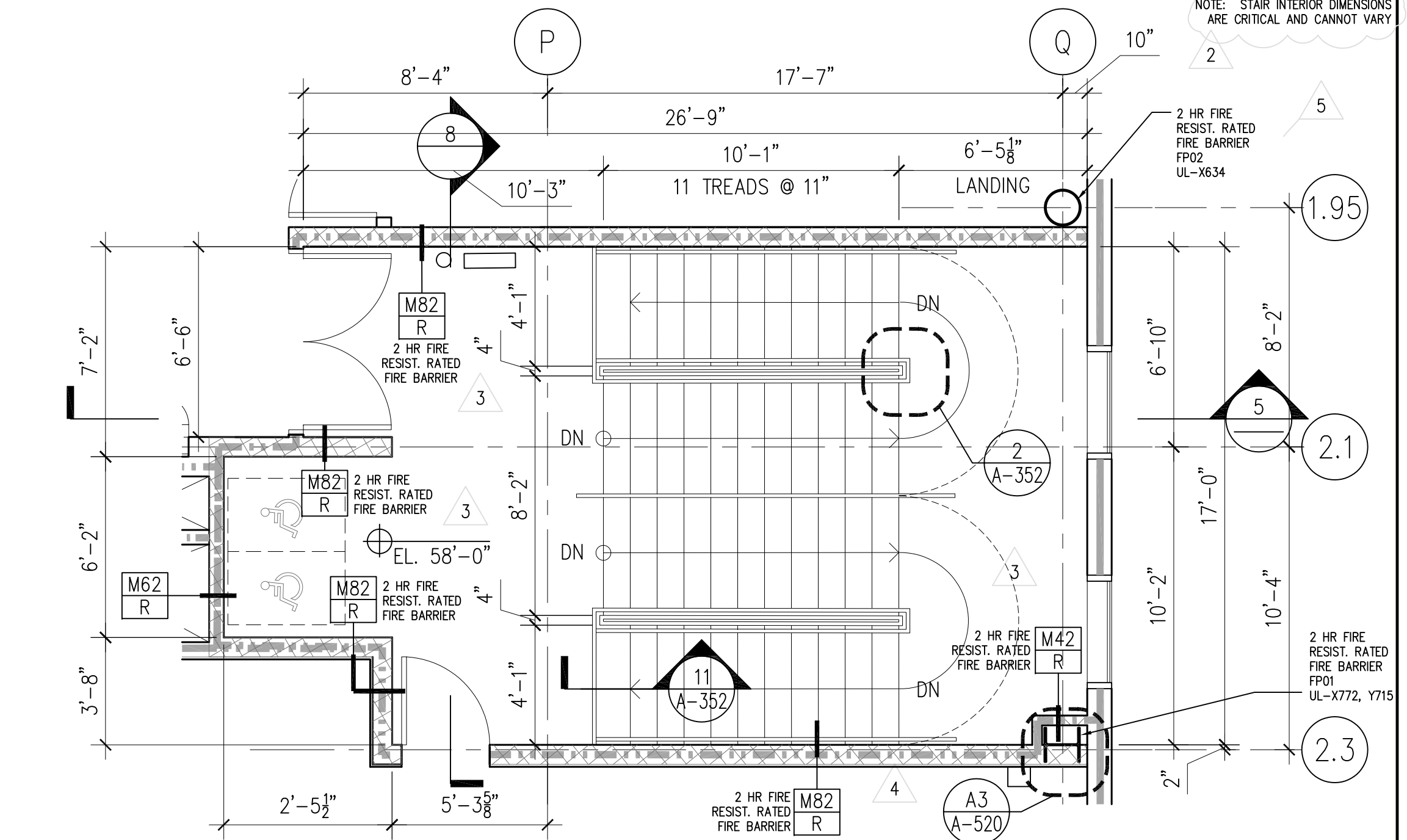
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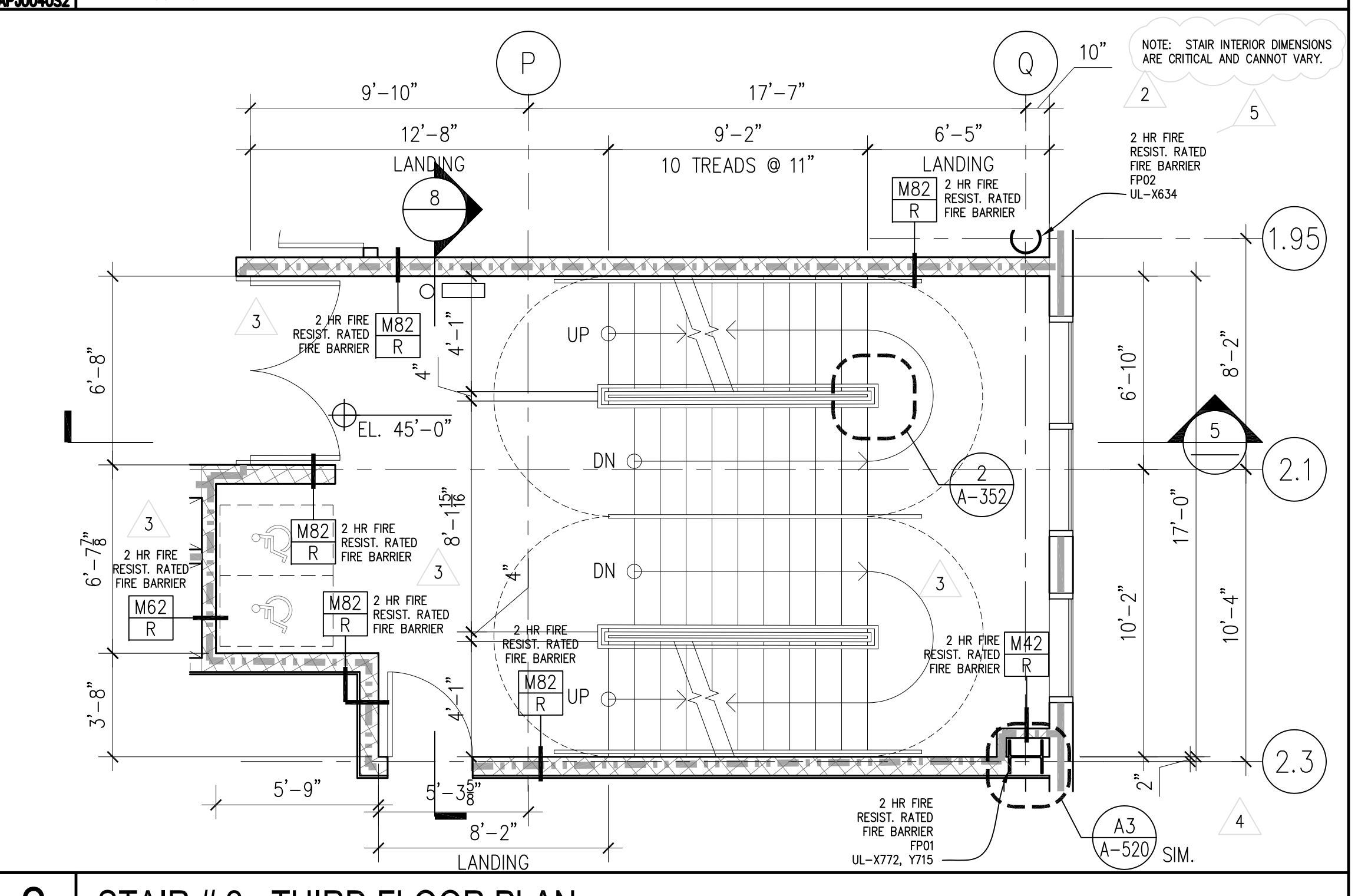
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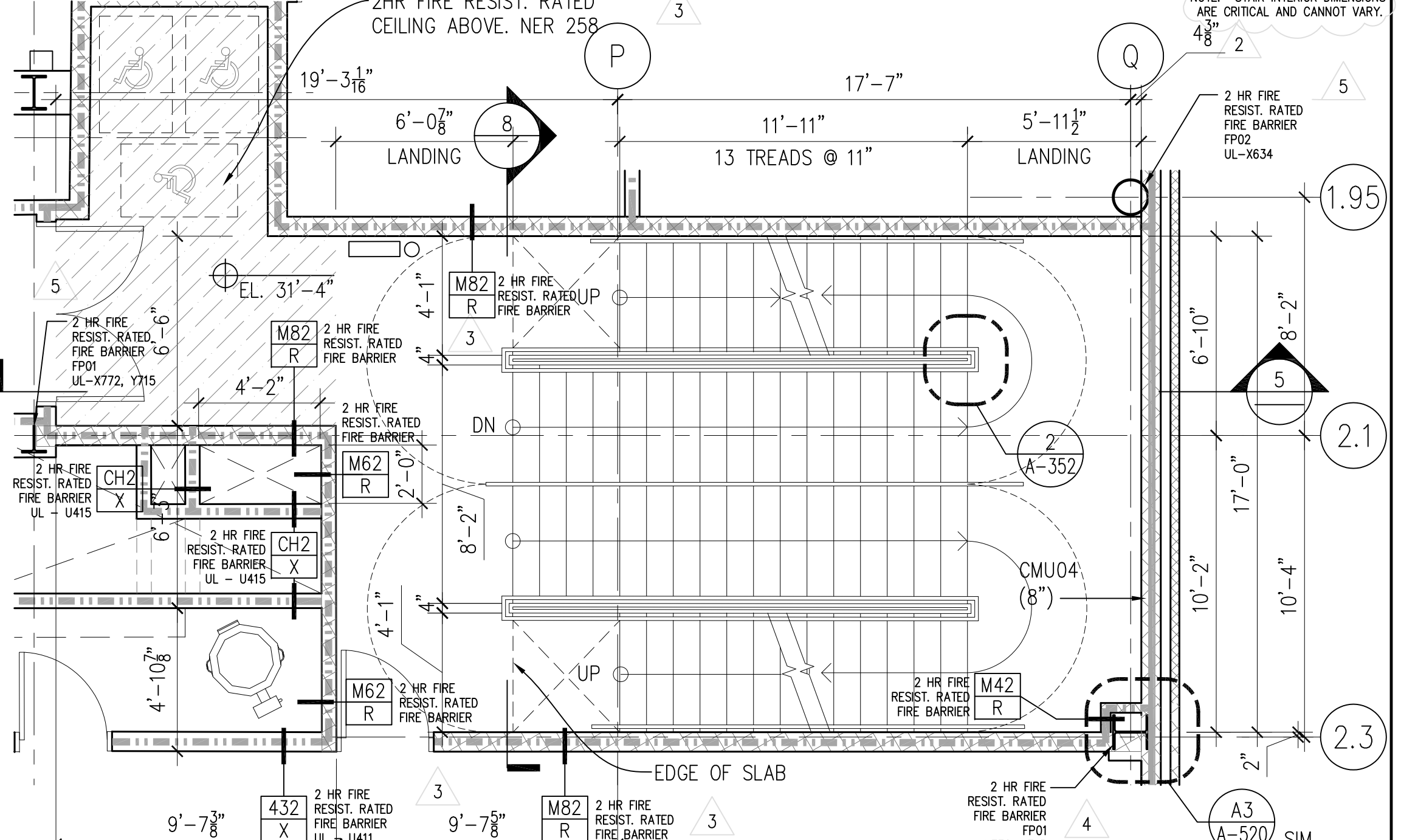
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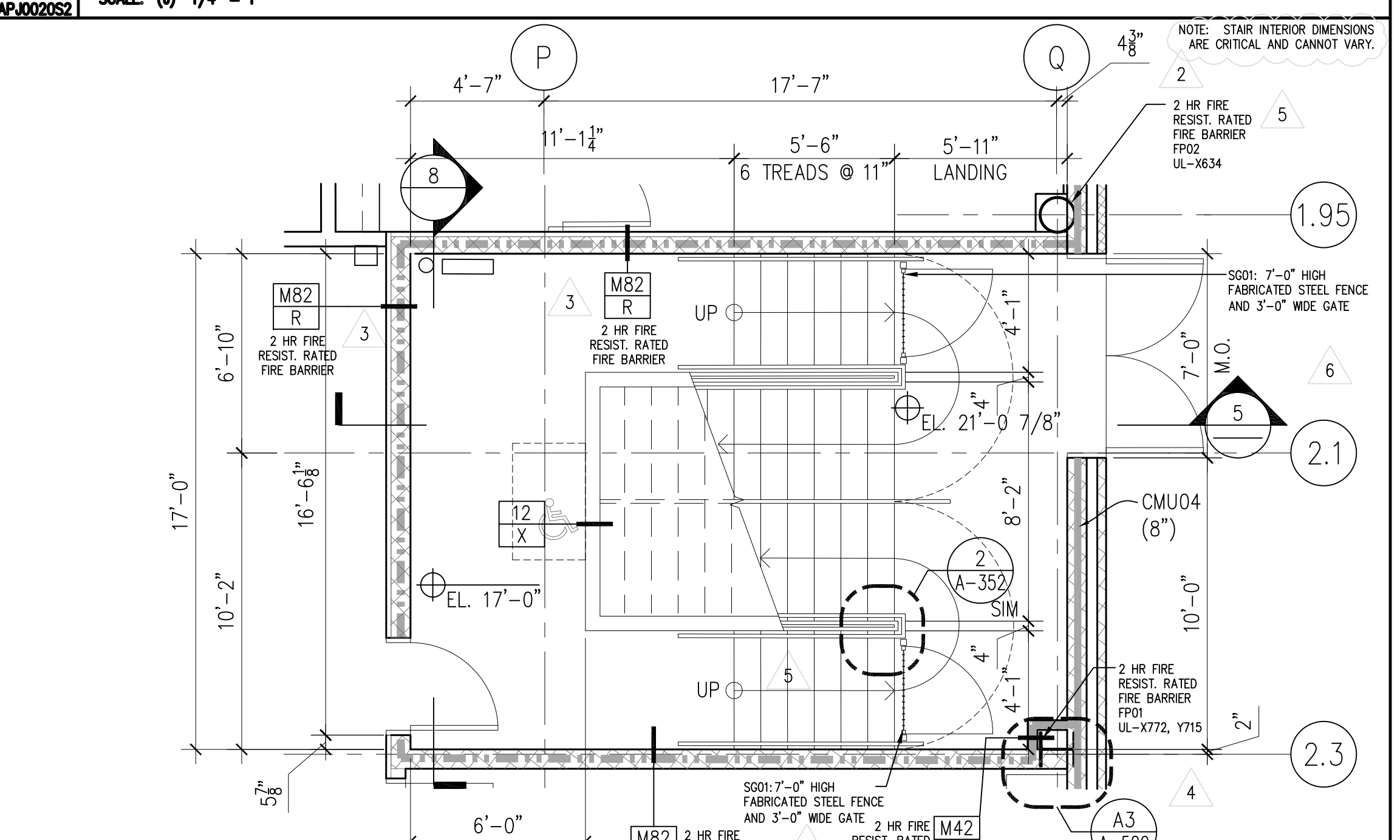
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2 STAIR #2 - THIRD FLOOR PLAN
SCALE: (A) 1/4\"/>



3 STAIR #2 - SECOND FLOOR PLAN
SCALE: (A) 1/4\"/>



4 STAIR #2 - GROUND FLOOR INTERMEDIATE LANDING LEVEL PLAN
SCALE: (A) 1/4\"/>

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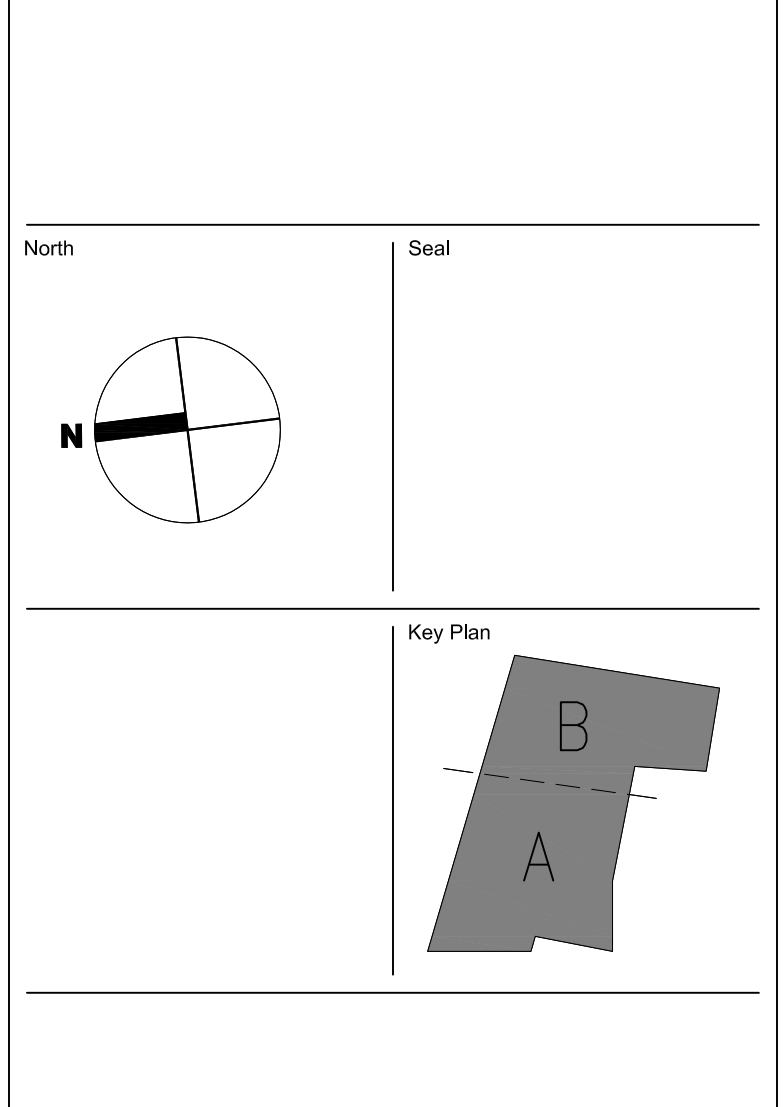
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SOW: 209065
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File Name:
A-305.DWG



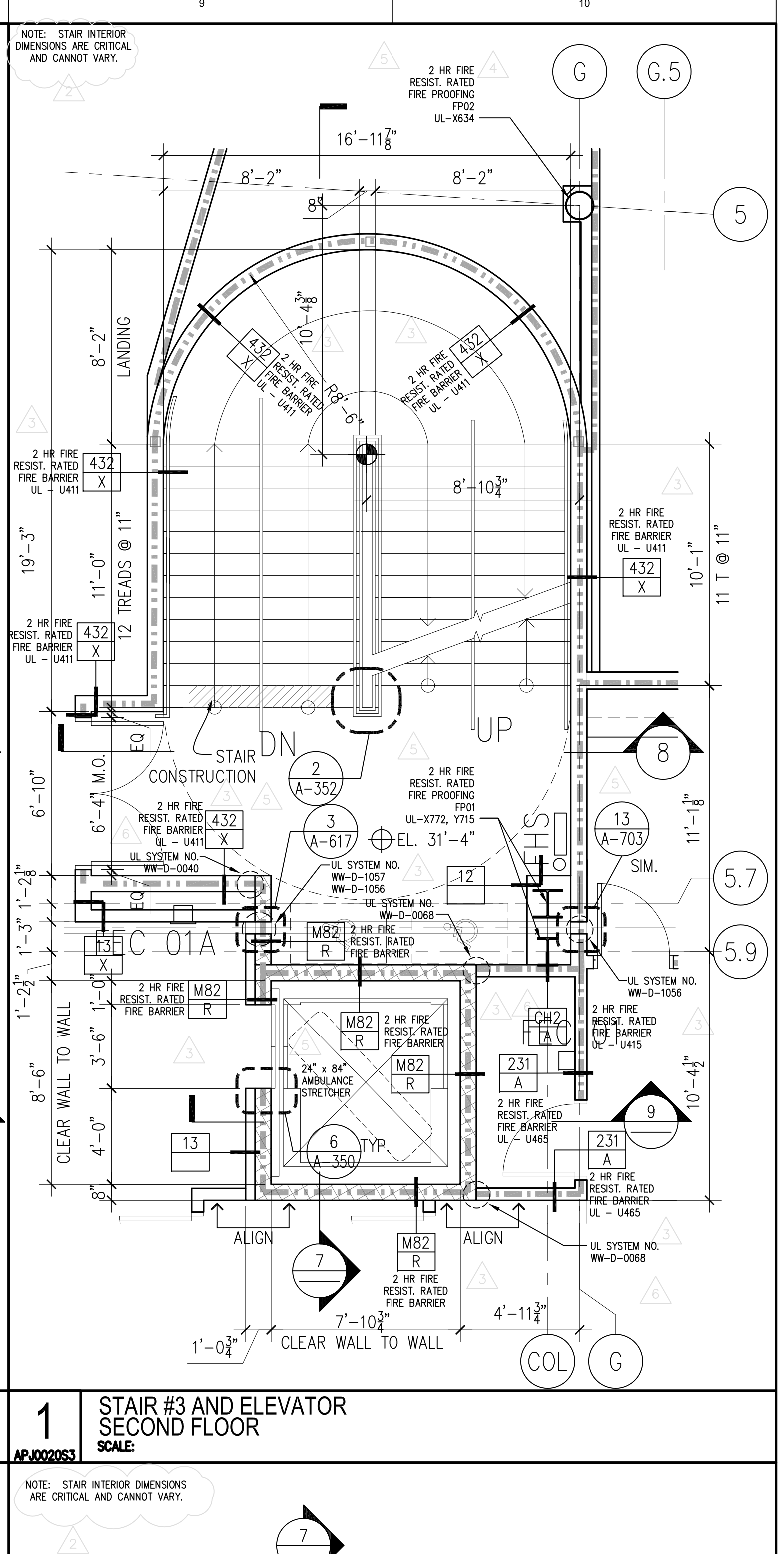
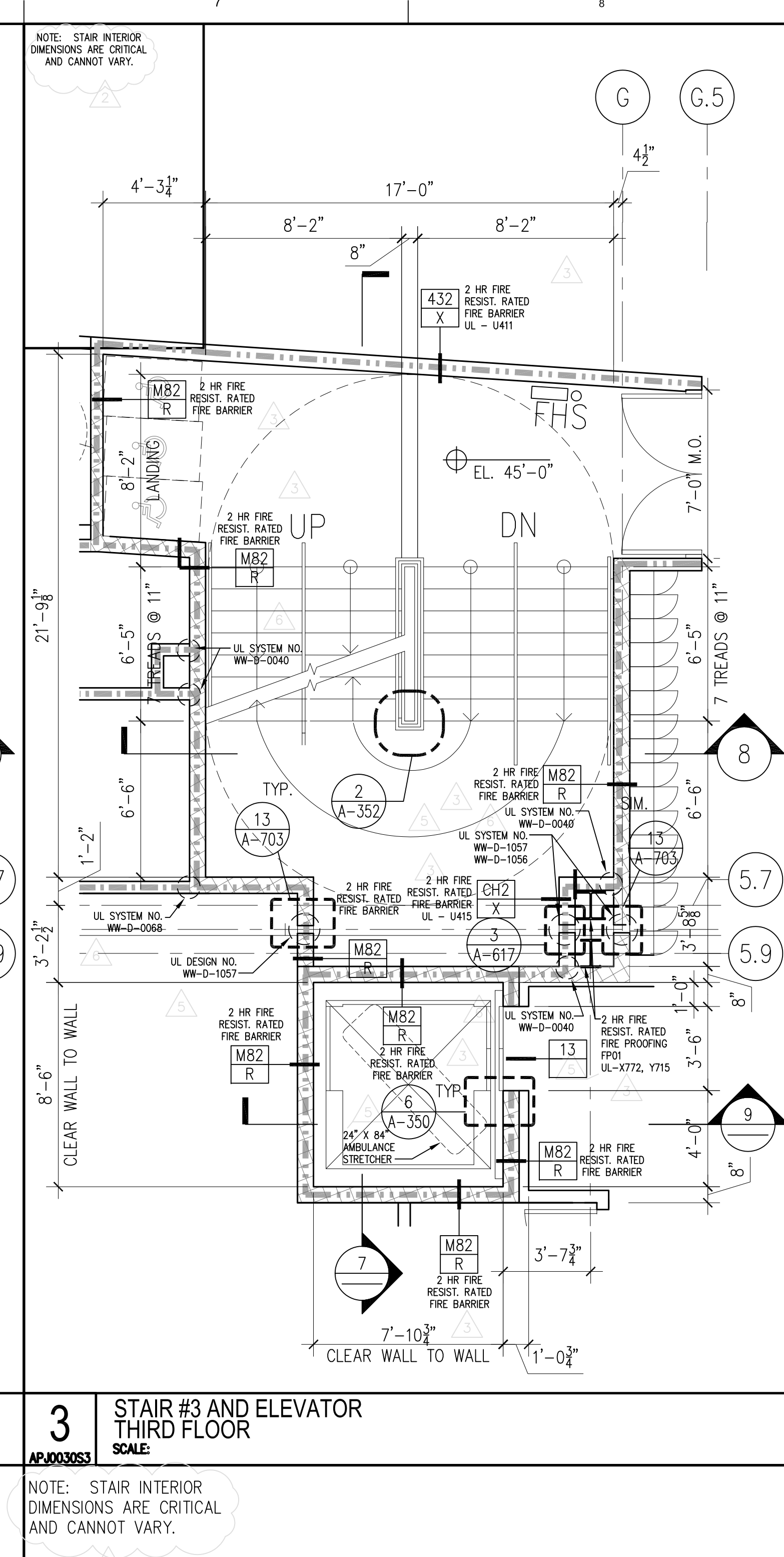
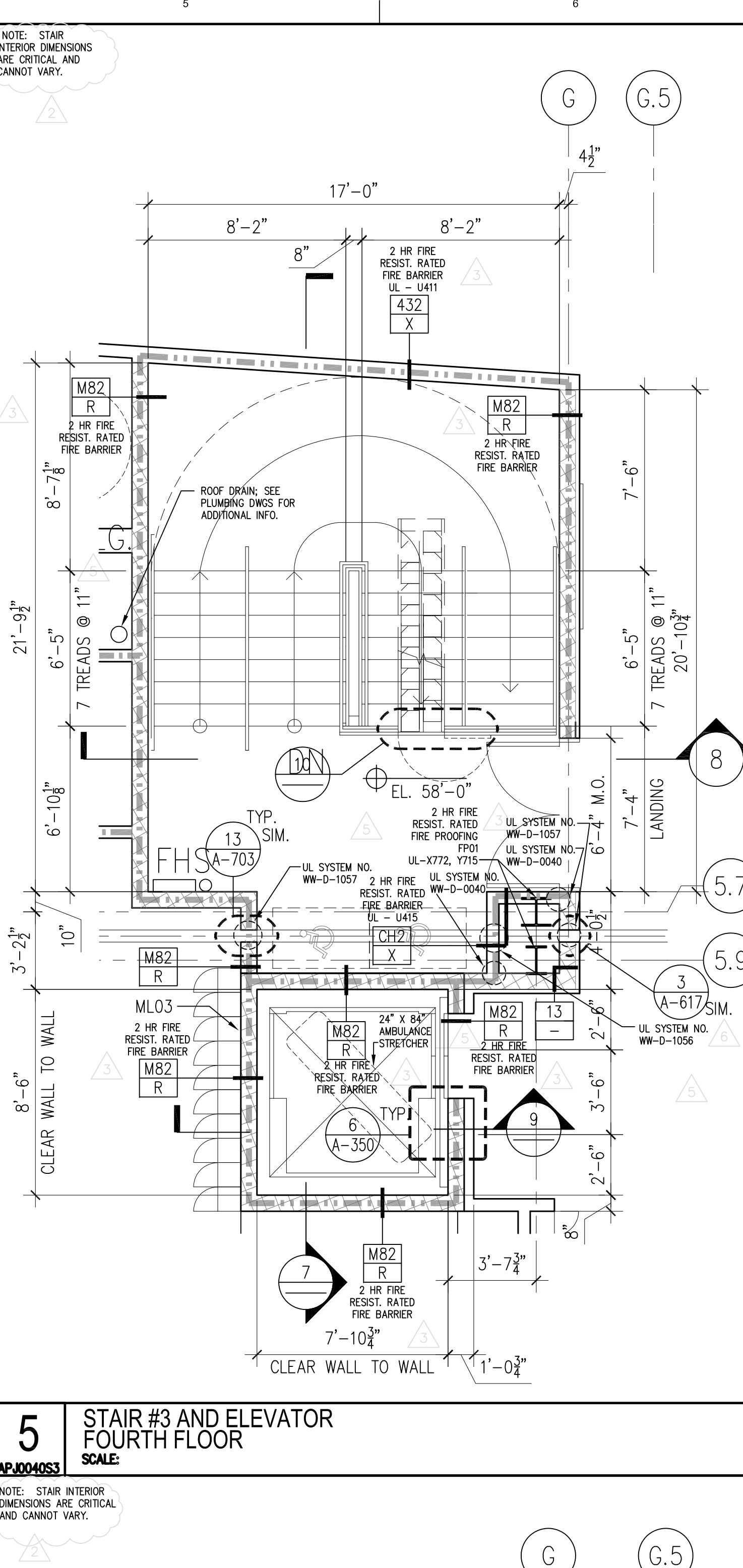
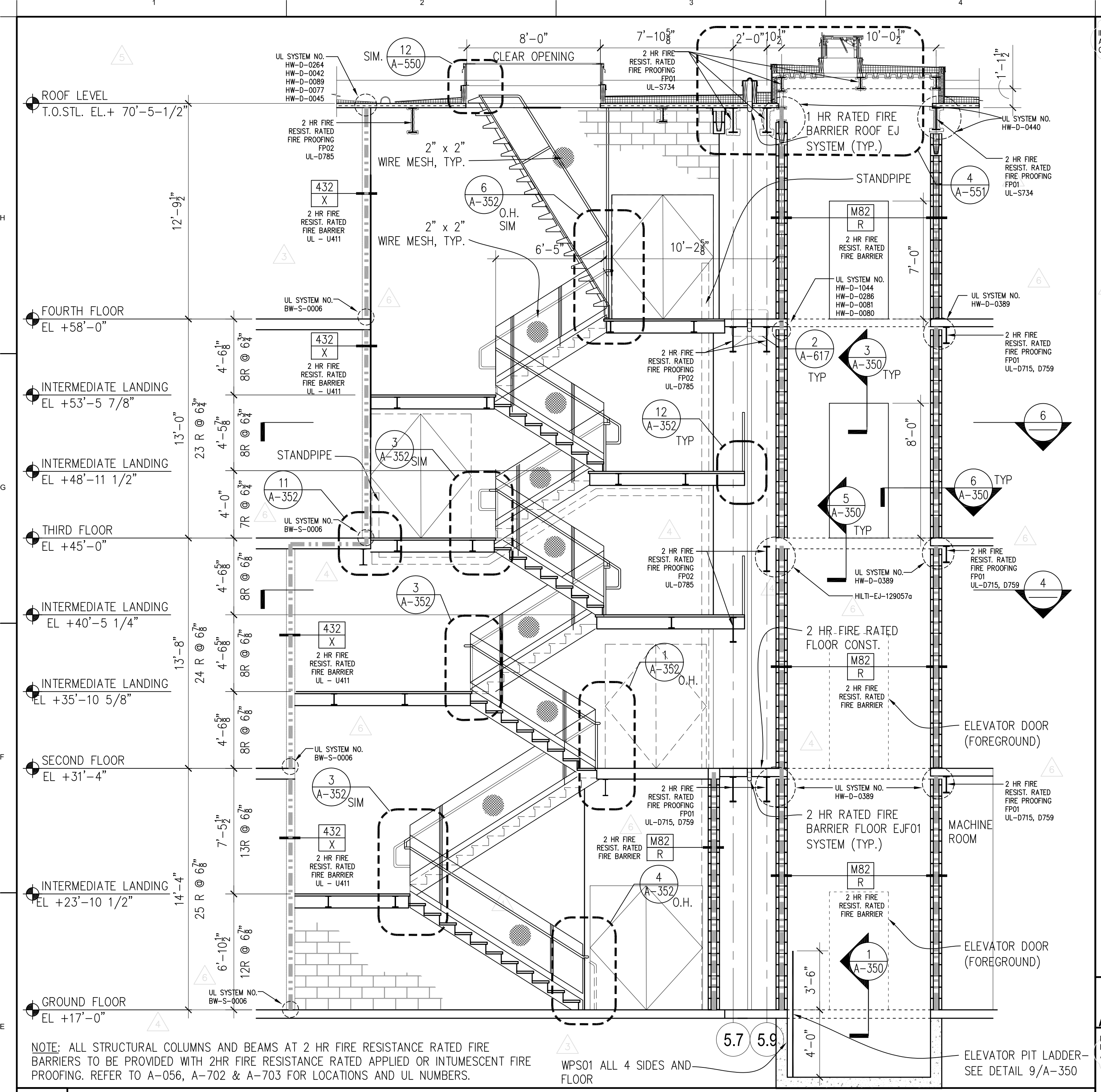
Elizabeth Academic High School
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EL-0006-C01

Addendum #5

Attachment #10 – Revised Drawing A-306

9/17/12

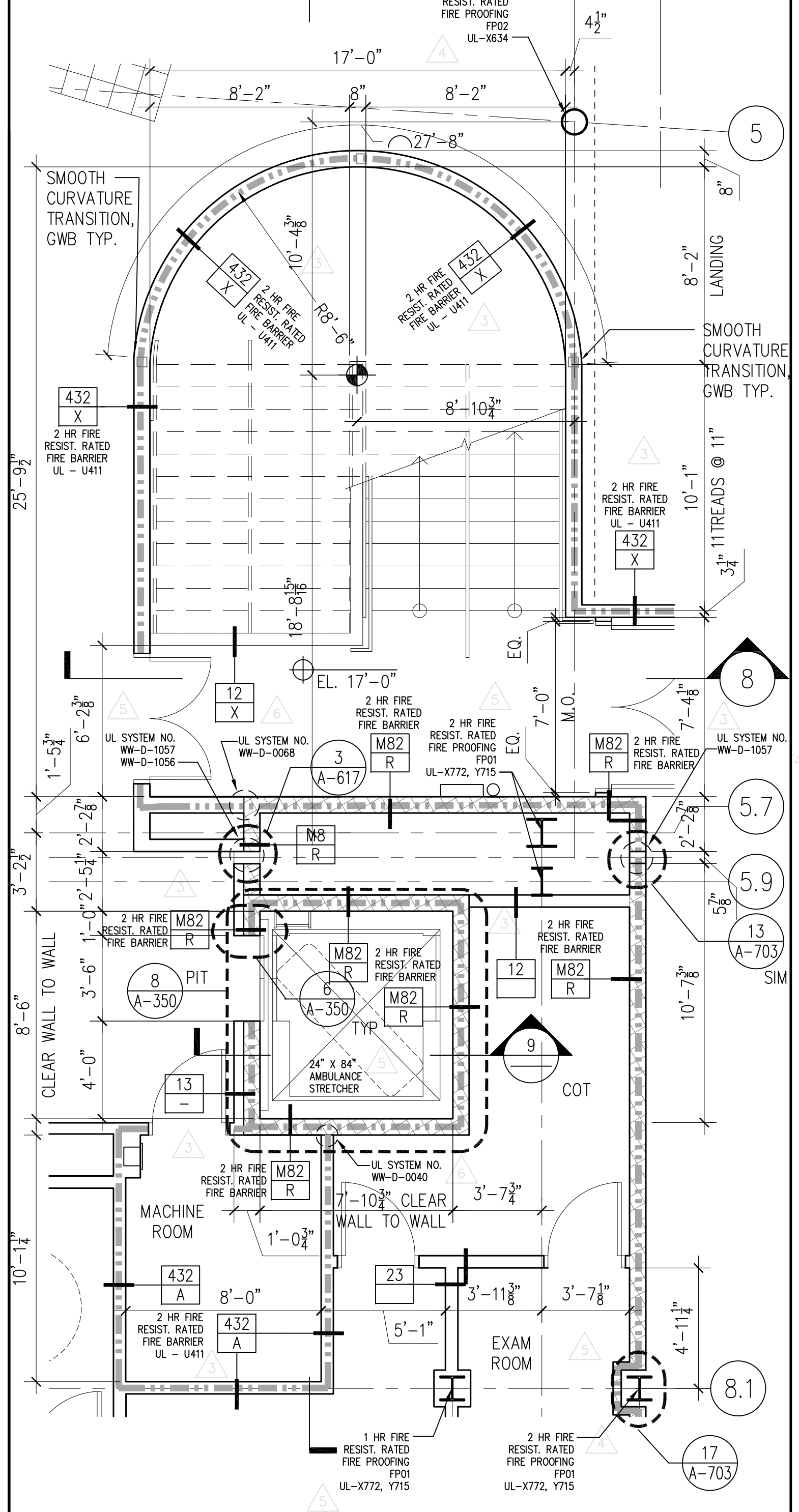
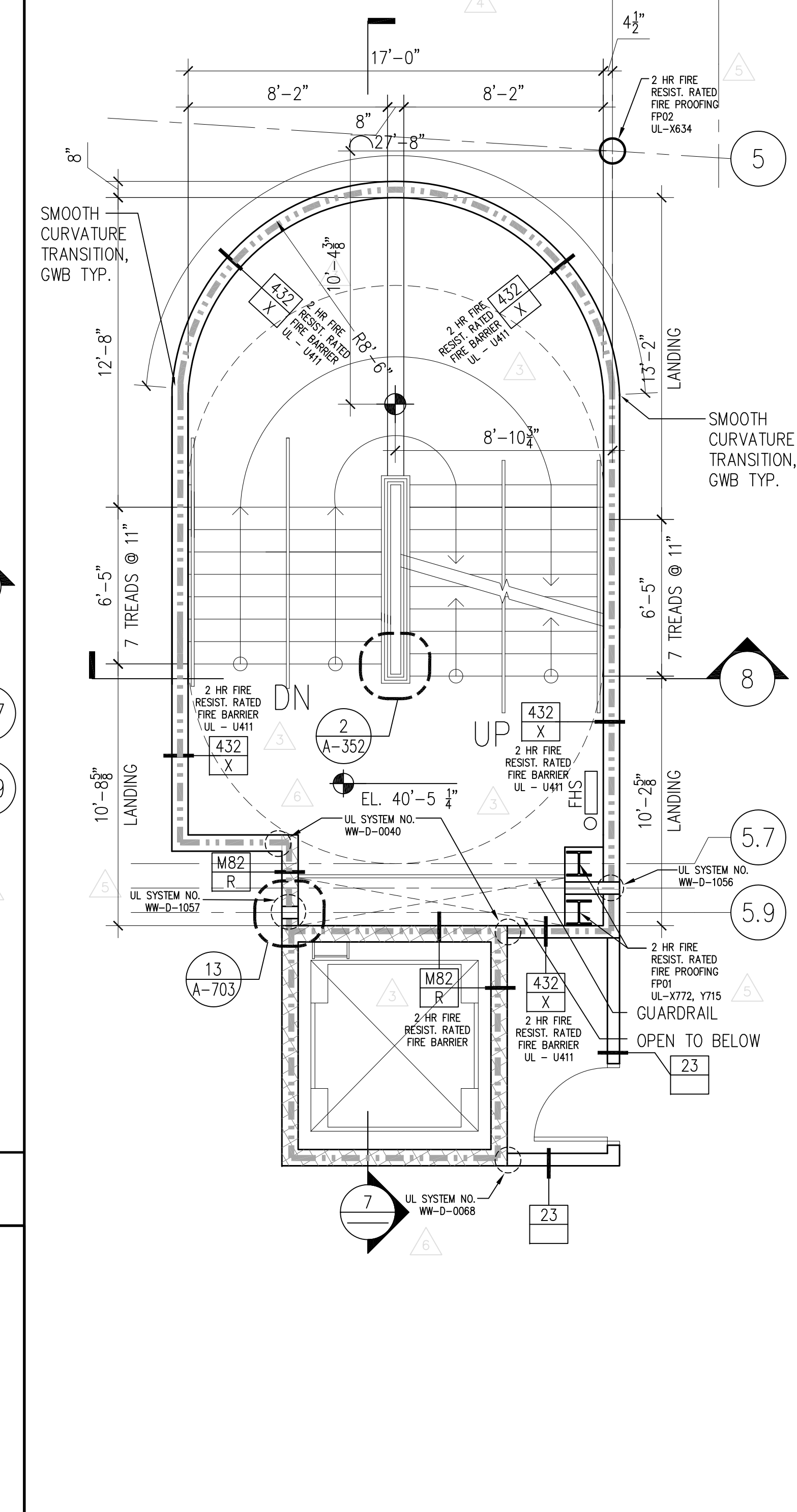
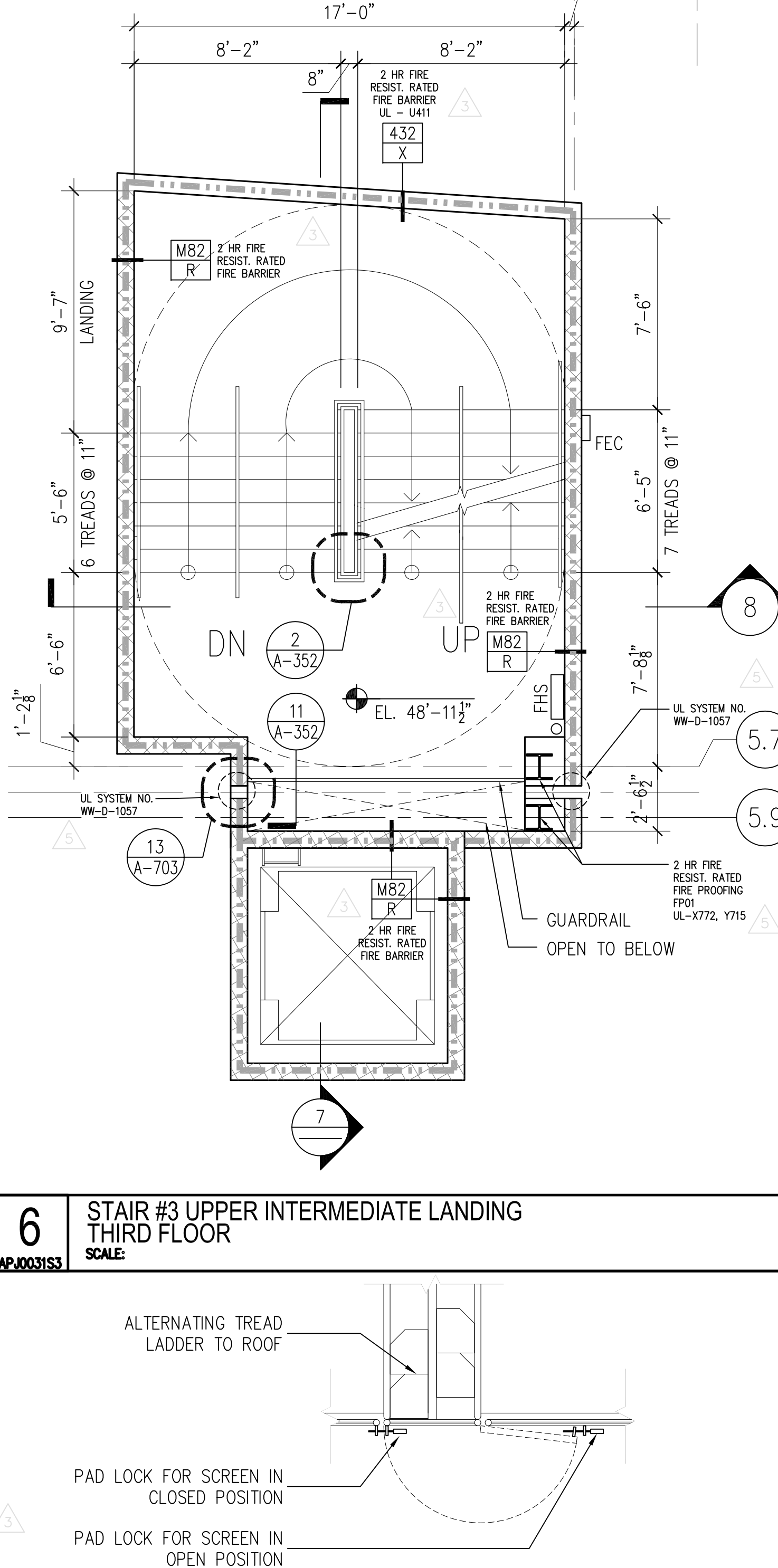
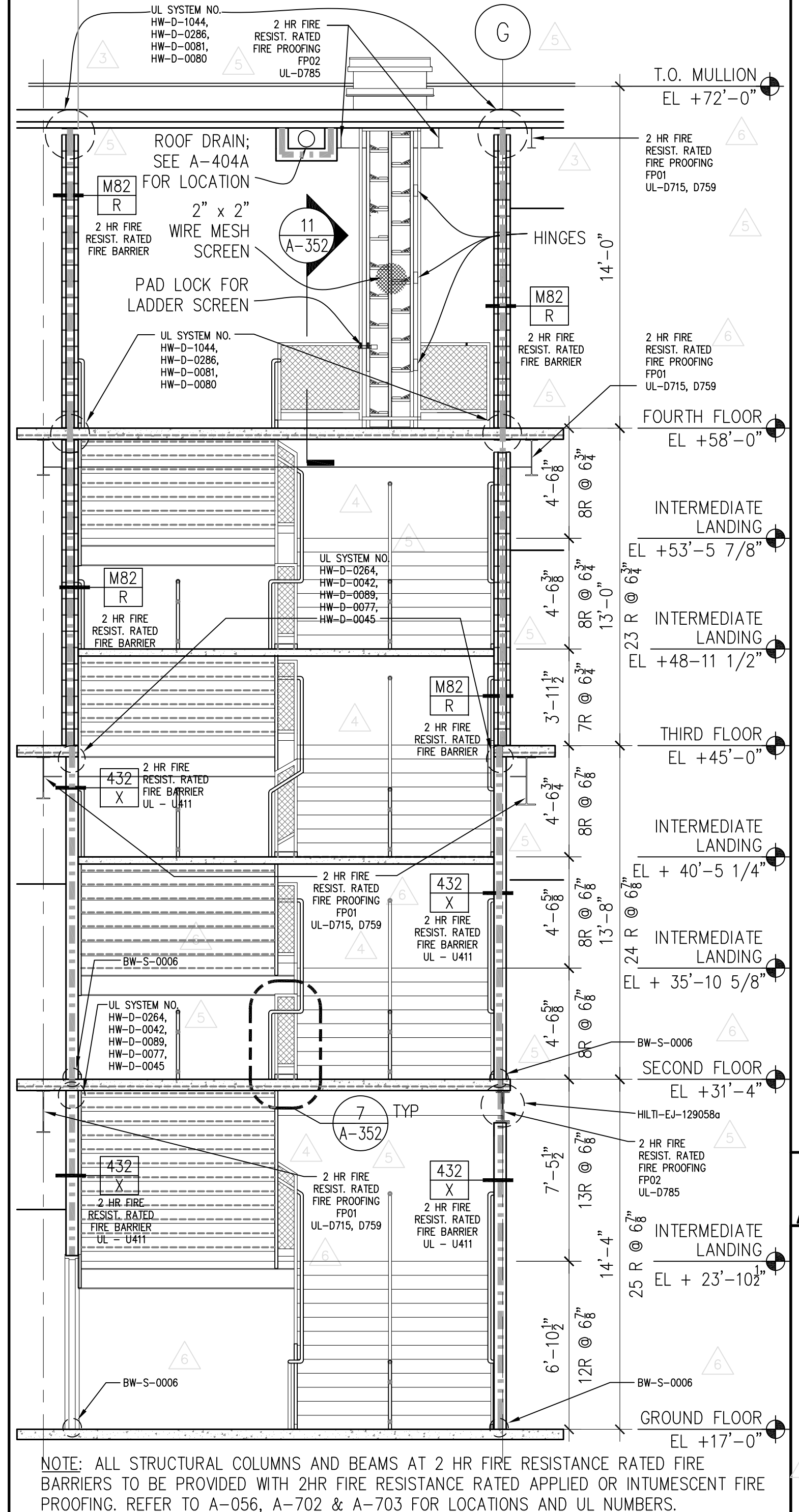
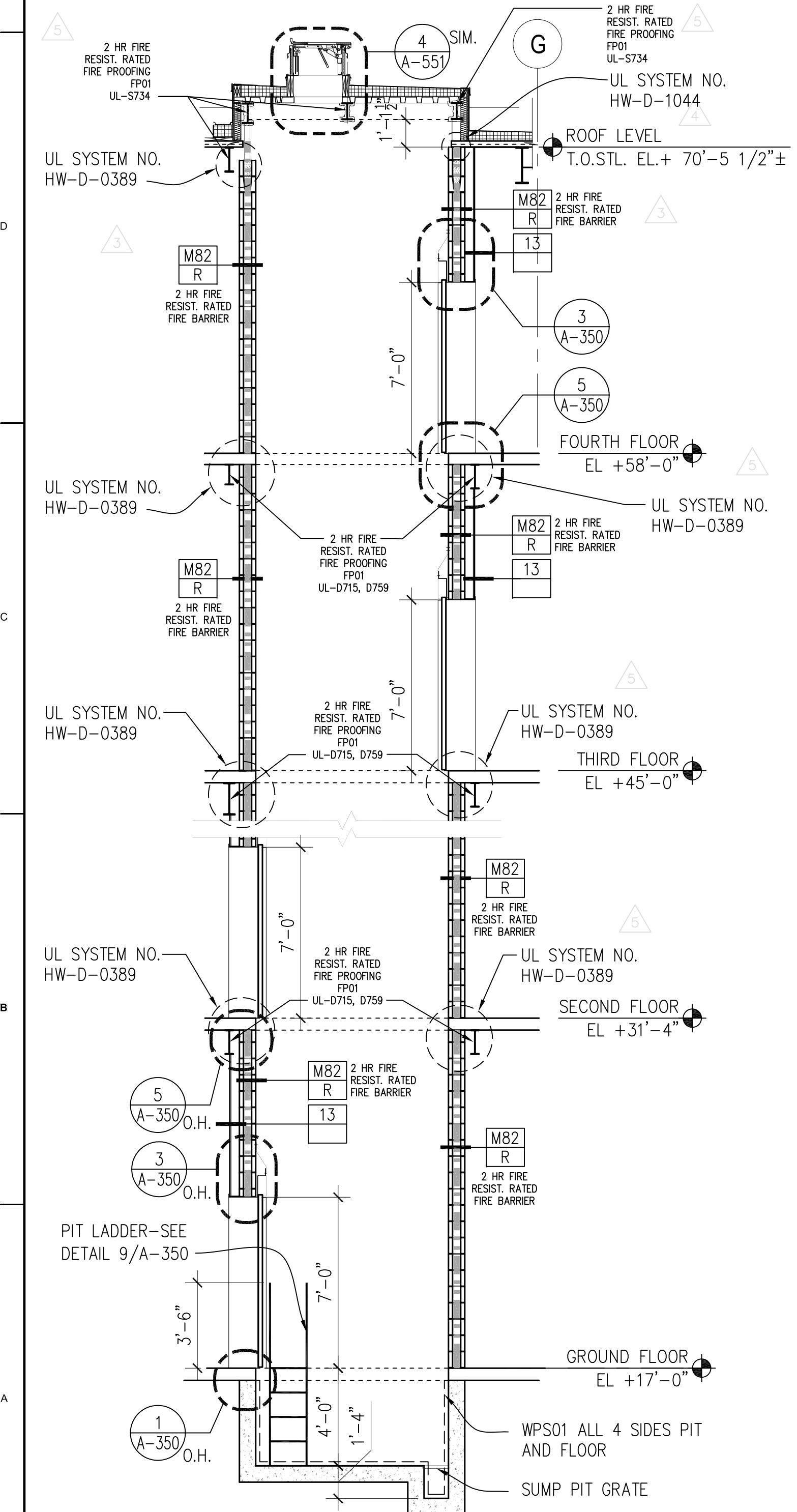


7 STAIR #3 AND ELEVATOR SECTION
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5 STAIR #3 AND ELEVATOR SECTION
SCALE: (1/4" = 1'-0")

3 STAIR #3 AND ELEVATOR SECTION
SCALE: (1/4" = 1'-0")

1 STAIR #3 AND ELEVATOR SECTION
SCALE: (1/4" = 1'-0")



9 ELEVATOR SECTION
SCALE: (1/4" = 1'-0")

8 STAIR #3 SECTION
SCALE: (1/4" = 1'-0")

10 ENLARGED LADDER GATE PLAN
SCALE: (1/2" = 1'-0")

4 STAIR #3 UPPER INTERMEDIATE LANDING
SCALE: (1/4" = 1'-0")

2 STAIR #3 ELEVATOR AND MACHINE ROOM
SCALE: (1/4" = 1'-0")

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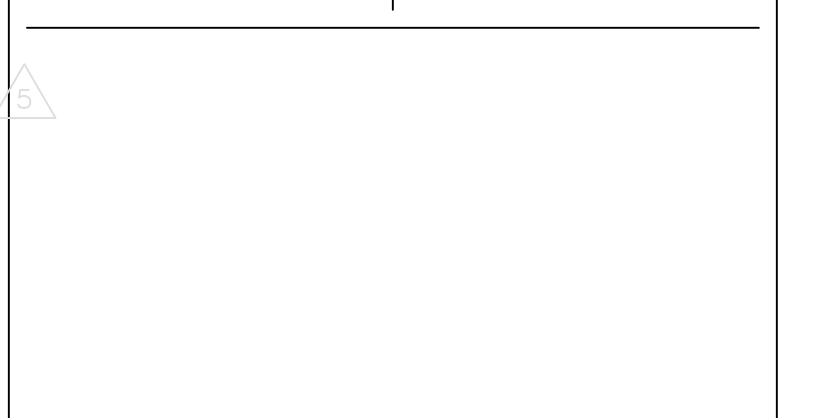
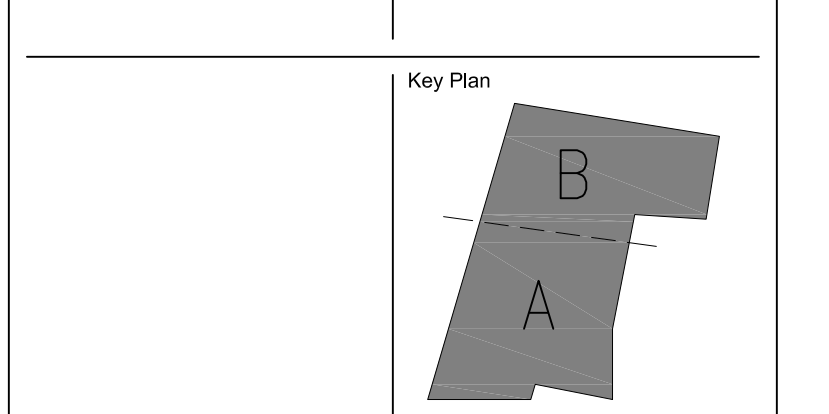
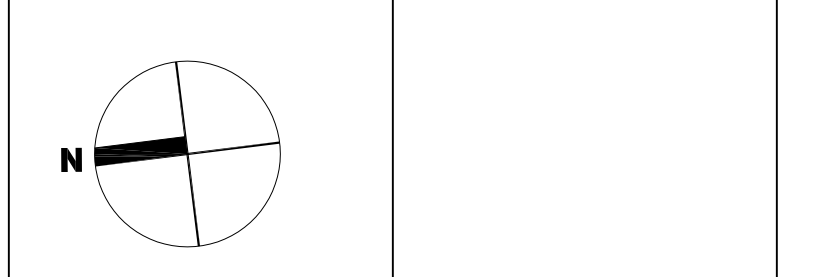
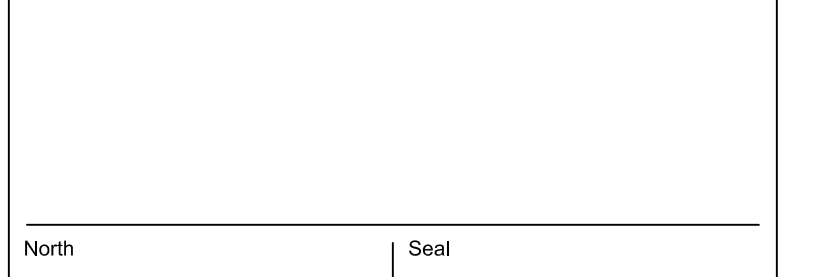
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STAIR #3 PLANS & SECTIONS



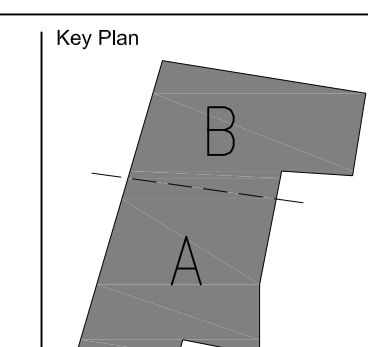
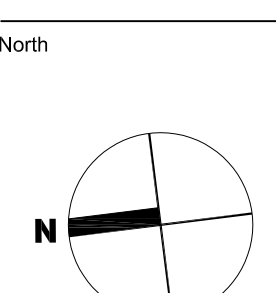
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Addendum #5

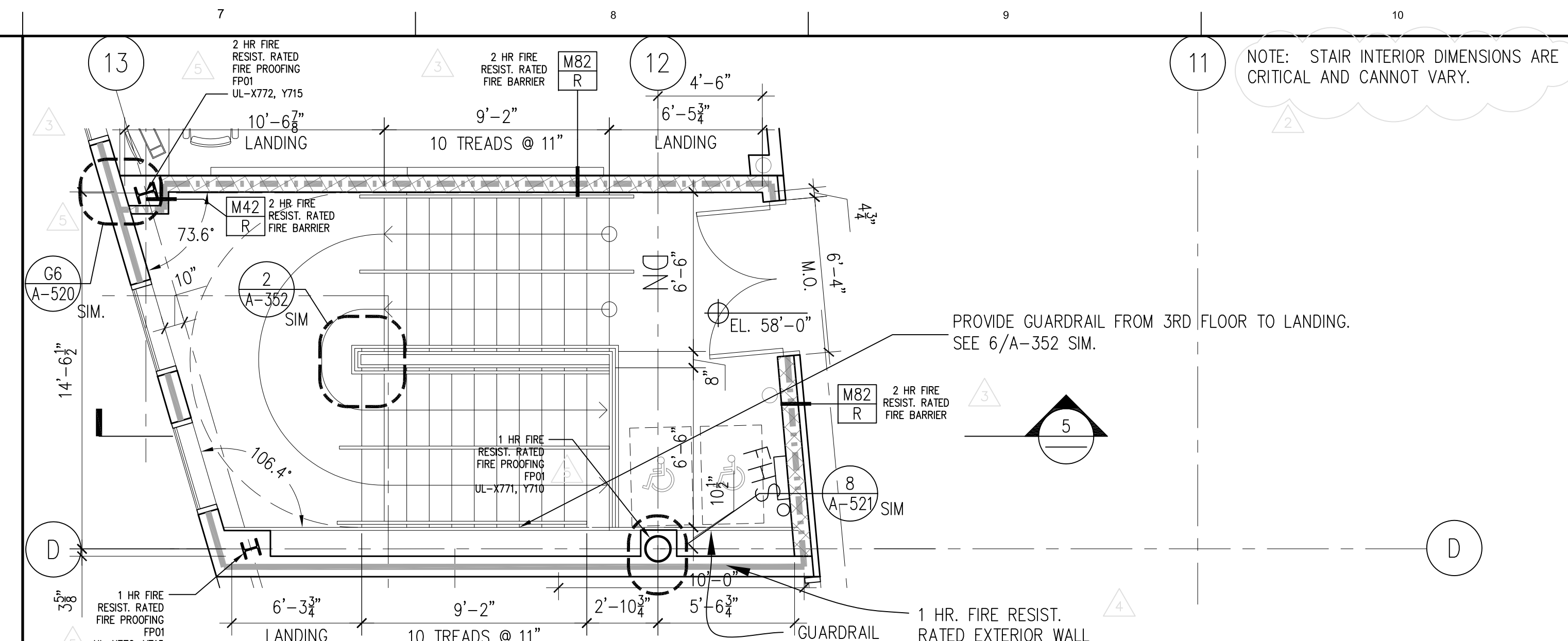
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9/17/12

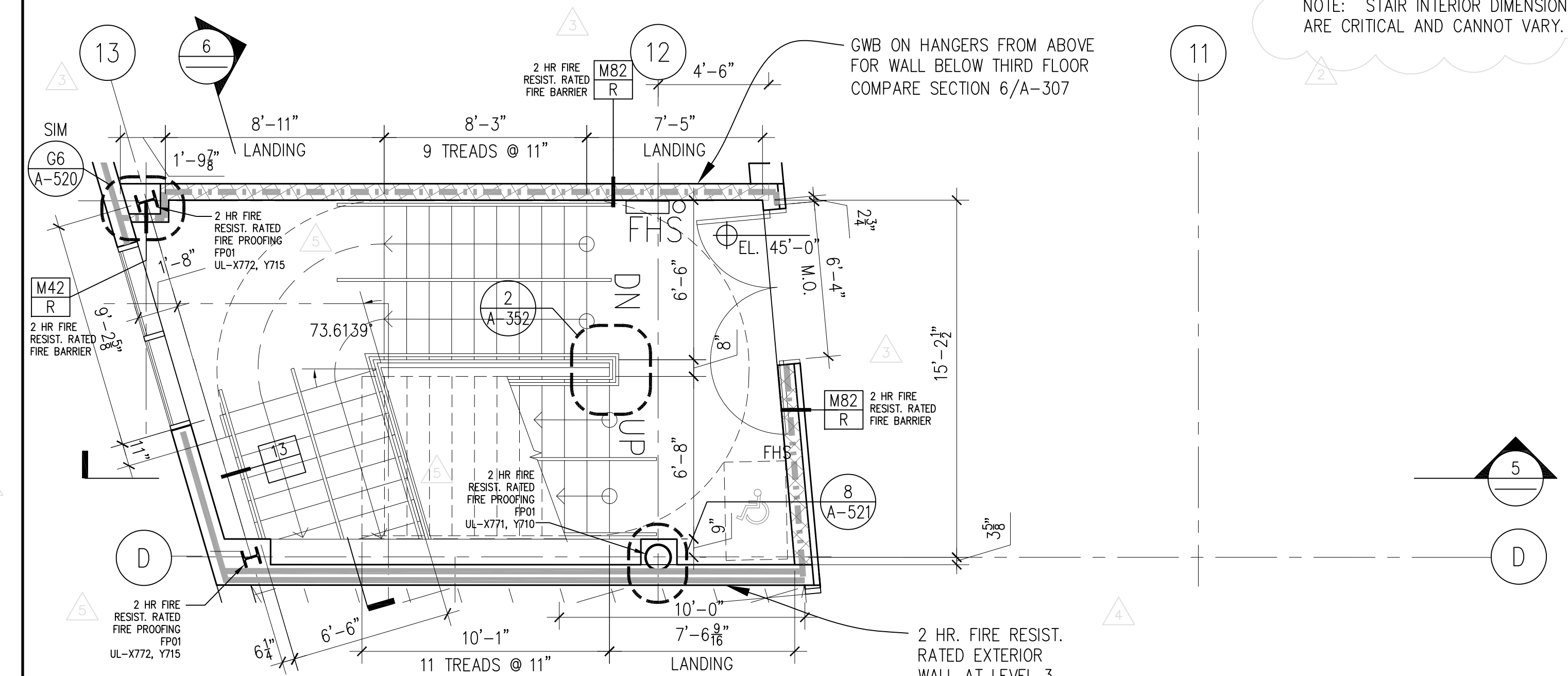


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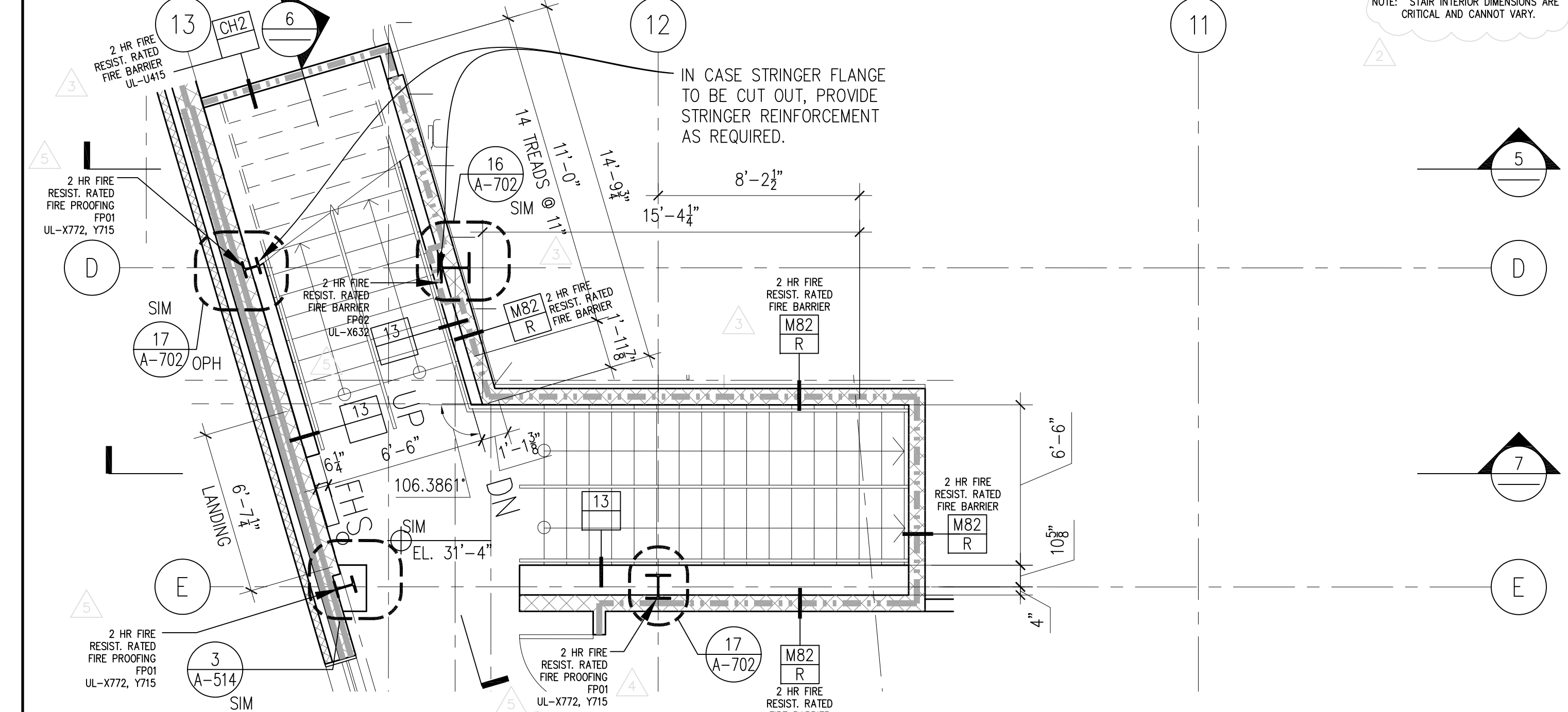
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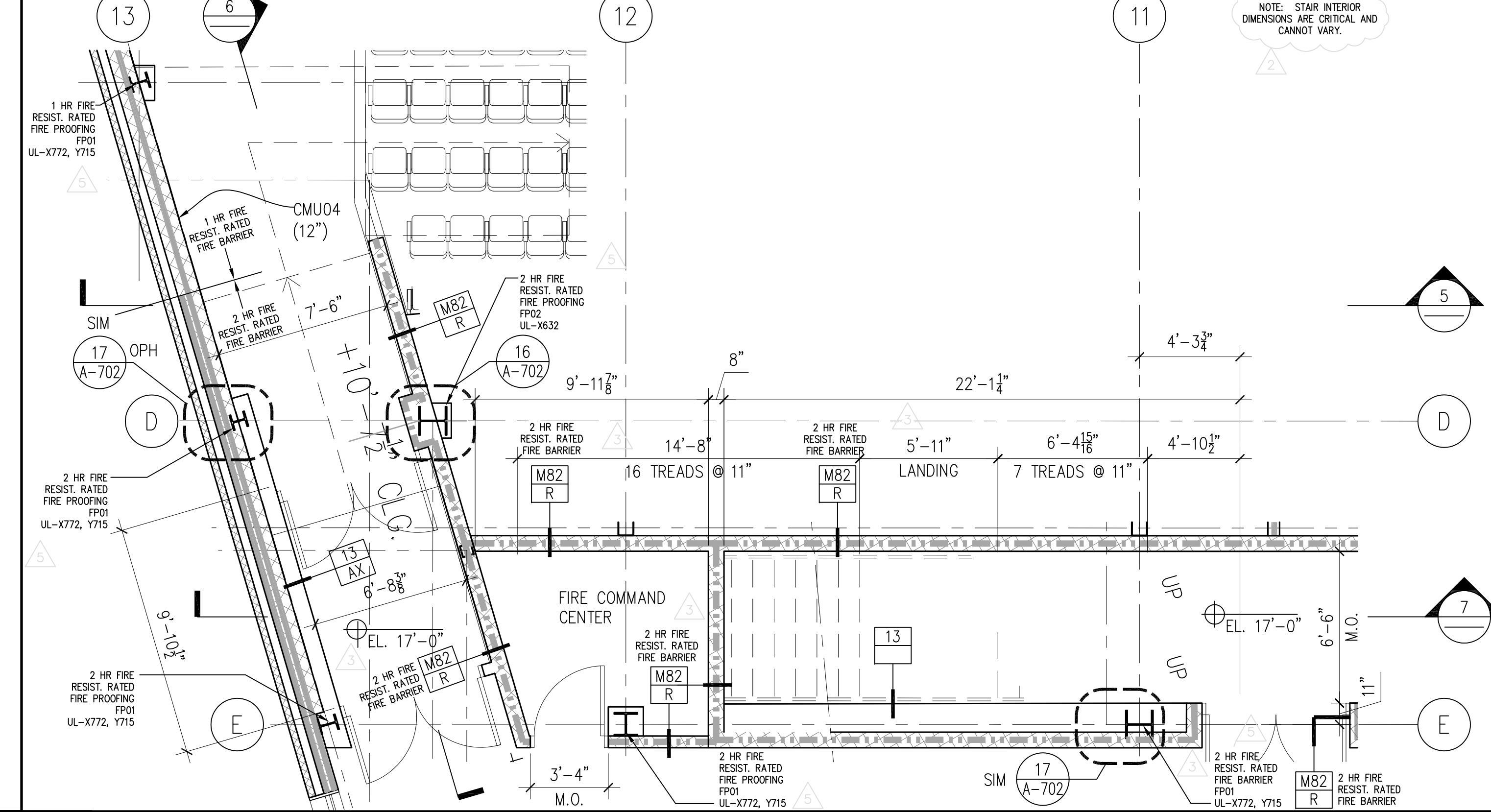
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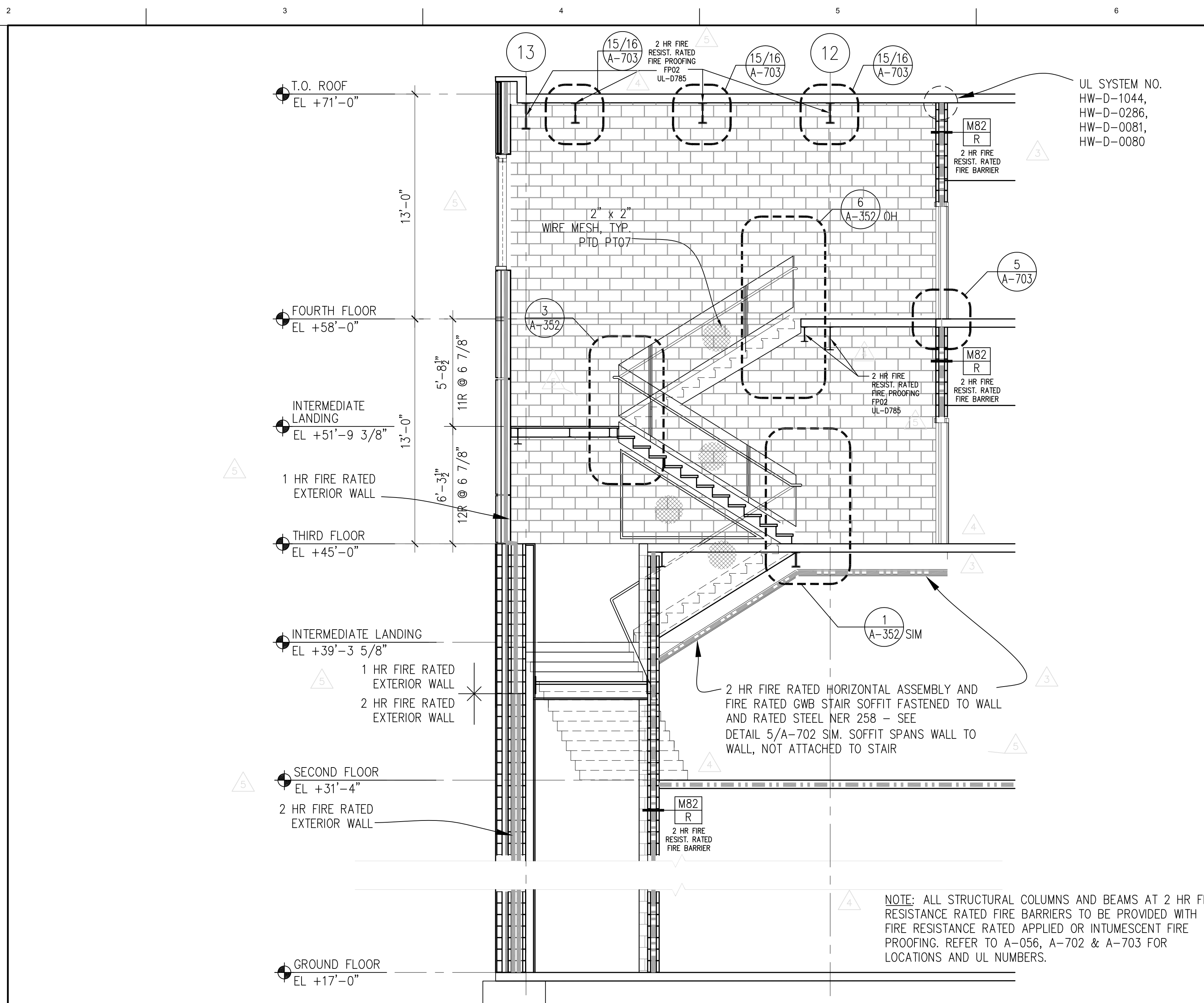
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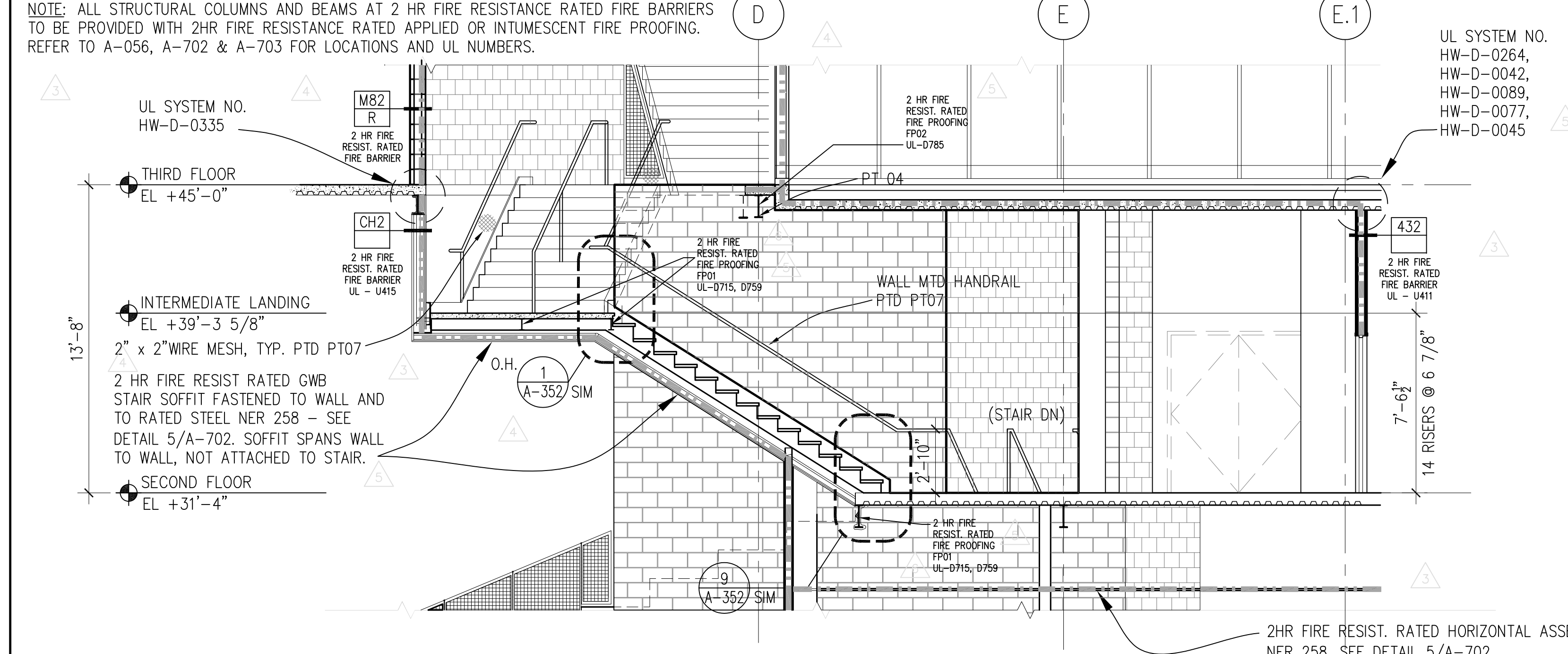
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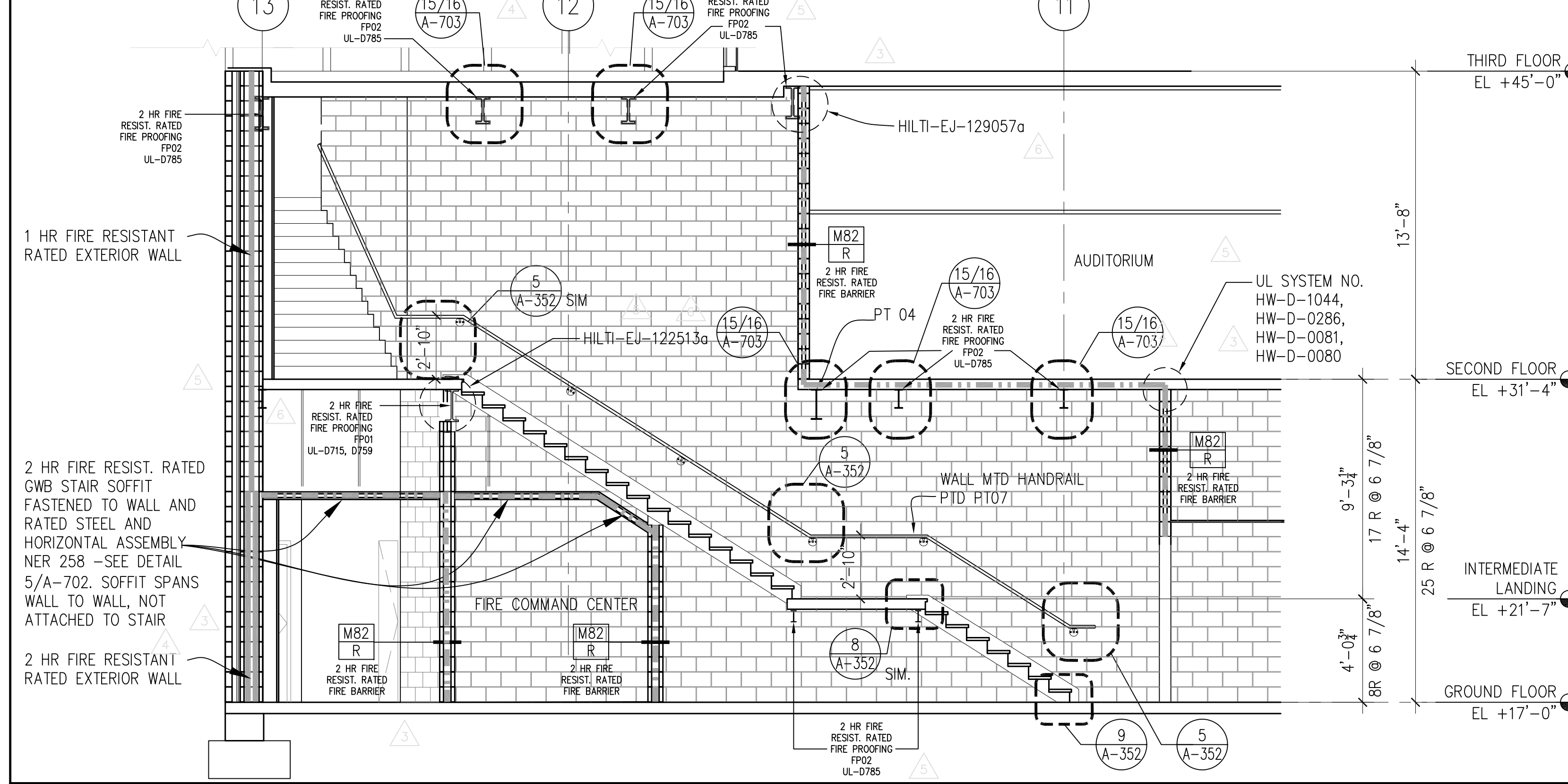
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5 STAIR #4 SECTION/ ELEVATION
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6 STAIR #4 SECTION/ ELEVATION
SCALE: (0) 1/4" = 1'



7 STAIR #4 SECTION/ ELEVATION
SCALE: (0) 1/4" = 1'



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #12 – Revised Specification Section 16570
Dimming Control

9/17/12

SECTION 16570 – DIMMING CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Electrical Contractor, as part of the work of this section, shall provide, install and test a complete lighting control system as specified herein for areas indicated on the drawings and circuit schedules.
- B. The Electrical Contractor shall furnish all conduit, wire, connectors, hardware and other incidental items necessary for the complete and proper operation of the lighting control system.
- C. The Electrical Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to:
 - 1. General Conditions
 - 2. Electrical Section General Provisions
 - 3. Conduit
 - 4. Wire and Cable
- D. Division 16 will be responsible to carry out the commissioning requirements specified in Section 16995 and Section 18100.

1.2 SYSTEM DESCRIPTION

- A. The system shall be designed for the control of architectural and theatrical lighting and shall consist of factory pre-wired dimming and processing rack enclosures containing dimmers, power supplies, breakers, terminals and/or control electronics.
- B. System shall work in conjunction with specified low-voltage control stations.

1.3 SUBMITTALS

- A. Manufacturer shall provide 10 sets of full system submittals. Submittals shall include:
 - 1. Full system riser diagram(s) illustrating interconnection of system components, wiring requirements, back box sizes and any special installation considerations.
 - 2. Full set of printed technical data sheets.
 - 3. Detailed set of dimmer schedules.
 - 4. Detailed set of circuit and control schedules, including a complete list of all deviations from specifications.

SECTION 16570 – DIMMING CONTROL

- B. Manufacturer shall provide any additional information, including equipment demonstration, as required by the engineer or specifier to verify compliance with specifications.

1.4 QUALITY ASSURANCE

- A. Manufacturer shall be one who has been continuously engaged in the manufacturer of lighting control equipment for a minimum of ten years. All dimmer and cabinet fabrication must take place in a U.S. manufacturing plant.
- B. Proposed equipment shall be UL and C-UL listed, and/or CE marked (where applicable) and bear the appropriate labels.
- C. All dimming cabinets and related components shall have been proven in the field for a minimum of 2 years.
- D. All dimming module components shall be attached to the dimmer module in a secure fashion with screws or bolts. Dimming modules using snap in components shall not be acceptable.
- E. There will be no exception to the call for dual 2.4k dimmer modules. Manufacturers utilizing quad 2.4k dimmer modules will not be accepted.
- F. Any revision or addition to the wiring required by substitute equipment shall be the responsibility of the substituting contractor. This contractor shall also be responsible for any additional architectural or engineering fees occasioned by the necessity of evaluating alternate proposals.
- G. All dimmers shall be located in dimmer banks as shown on drawings. Dimmers integrated into connector strips will not be accepted.
- H. All data distribution shall be processed via Ethernet. Systems not using Ethernet shall not be acceptable.
- I. All dimmers, enclosures, controls and fixtures shall be manufactured in the United States. Equipment manufactured outside of the United States will not be accepted.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Strand Lighting (Basis of Design on Drawings and Specification)
 - 2. Electronic Theater Controls
 - 3. Or Approved Equal.

SECTION 16570 – DIMMING CONTROL

2.2 WORK INCLUDED

- A. The dimmer racks shall be fully digital, designed specifically for entertainment and architectural lighting, and shall consist of 24 or 48 dimmer module spaces. Dimmer rack systems shall be ETL and cETL marked devices.
- B. Rack setup and preset data shall, as standard, be fully user programmable on a per rack or system wide basis. The dimmer rack shall report rack status to a remote personal computer or control console and, as an option, report dimmer status information.

2.3 MECHANICAL

- A. The dimmer rack shall be a freestanding, dead front switchboard, substantially framed and enclosed with 16-gauge formed steel panels. All rack components shall be properly treated, primed and finished in fine texture, scratch resistant, coating.
- B. The 48 module dimmer rack shall not exceed 80" H x 24.5" W x 23.6" D. Racks shall be designed to allow for adjacent mounting and for bolting to the floor. The 24 module dimmer rack shall not exceed 57" H x 24.5" W x 23.6" D. Rack doors shall not increase the total rack depth by more than 1.0", and will not increase the rack footprint.
- C. The dimmer rack shall be designed to allow for easy insertion and removal of all modules without the use of tools. Optional dimmer row tie down bars shall be available to mechanically block each row of six dimmer modules into the rack and require the use of a tool. Dimmer supports shall be provided for precise alignment of dimmer modules into power and signal connector blocks.
- D. Rack spaces shall be mechanically keyed such that modules of greater current capacity cannot be accepted for that space. Racks that allow modules of higher wattage to plug into the same space shall not be acceptable.
- E. Multiple low-noise fans shall be provided to allow redundancy in case of fan failure. The fans shall maintain the temperature of all components at proper operating levels with dimmers at any load, providing the ambient temperature of the dimmer room does not exceed 95 degrees Fahrenheit (35 degrees Celsius). Air shall flow over the surfaces of the heat generating components using a combination of convection and fan assisted airflow. Each rack shall be outfitted with a lockable door that does not impede airflow in any manner.
- F. Fans shall be gradually controlled between off and full speed in order to minimize fan noise under all operating conditions. In the event of a rack over temperature condition, a warning shall be displayed on the rack LCD display and remote personal computer (via web browser) and control console (via web browser). If the temperature rises 5 degrees C over the warning threshold, the dimmer rack shall shut down automatically. The system shall also provide low temperature shutdown below 33 degrees Fahrenheit (1 degree Celsius) to prevent condensation damage to system electronics.

SECTION 16570 – DIMMING CONTROL

- G. Load terminations shall be clearly marked with the dimmer rack circuit number. Signal terminations shall be by plug-in screw terminals or insulation displacement to facilitate contracting and servicing and shall be clearly labeled. Rear access shall not be required for rack installation and termination.
- H. Module numbering shall be clearly marked via a numbering strip on the front of the dimmer module tray. Standard number strips shall be available in two channel module configurations. Custom lamacoid number strips may be used on custom installations.

2.4 ELECTRICAL

- A. Dimmer racks shall operate at 90 to 264VAC 3-phase, 4 wire + ground or 90 to 264VAC, 1 phase, 2 wire + ground, 47 - 63 Hz at a maximum of 800A per phase. 2400A per phase bussing across adjacent multiple racks shall be possible.
- B. Load circuit wiring terminals for line, neutral, and ground terminals shall accept up to a #6 AWG wire. An optional terminal adapter accepting up to #2 AWG wire shall be available. The fault current protection of the rack shall be 50,000 AIC. Provisions shall be made for optional amp trap devices to provide 100,000 AIC fault current protection if required.
- C. Dimmer racks shall be available with side or bottom power feeds to meet a wide range of installation requirements.

2.5 RACK ELECTRONICS, PHYSICAL

- A. The main dimmer control electronics shall be housed in a Rack Processor Module (RPM). The dimmer control electronics shall be completely digital without employing any digital to analog demultiplexing schemes or analog ramping circuits.
- B. All rack setup and preset data shall be stored in a non-volatile manner and may be transferred to a replacement Rack Processor Module without losing data.
- C. Each Rack Processor Module shall have a back-lit LCD display with a six key (minimum) keypad for rack setup, preset control, testing, rack status, error and diagnostics. Bi-Color LED's shall indicate "Network Connection", "DMX512 Port A", "DMX512 Port B", "Processor OK", "Module Event", "Panic", "Over temperature" "Phase A", "Phase B", "Phase C", "Active Processor".
- D. An optional backup Rack Processor Module shall provide full redundant tracking processor functions. The Backup RPM shall track all setup, preset and other commands at all times without any operator action. The Backup RPM shall take over all communications and dimming control upon automatic activation.
- E. All rack setup and preset data shall be electronically transferable between the main Rack Processor Module and the backup RPM in case of the replacement of either of the modules. Rack set up data shall be stored in non-volatile memory.

SECTION 16570 – DIMMING CONTROL

- F. The Rack Processor Module shall provide signal connections in conjunction with optional power supply units. The RPM shall provide the only point for contractor connection of signal cables and PANIC activation. The contractor connections shall be made with two-part plug in screw terminals (dedicated connector per input) or crimped RJ45 connectors for ease of installation. The RPM shall feature an integrated Ethernet switch to permit the cross connection of up to 4 dimmer racks in a single dimmer room. RPM to RPM Ethernet connections shall be made with pre-made RJ45 patch cables.
- G. All DMX512 & RS485 communication ports and remote contact input connections shall be optically isolated from all processor electronics by a minimum of 2,500V RMS isolation.
- H. The Rack Processor Module shall have the provision to select any of a maximum of 96 dimmer outputs to be activated by the PANIC function. The PANIC function shall be activated or de-activated by one or more local or remote contact closures.

2.6 RACK ELECTRONICS, CONTROL AND COMMUNICATIONS

- A. The control electronics shall provide the following control and communication inputs as standard:
 - 1. An Ethernet control input. This input can support a connection to a Strand ShowNet system. Each Ethernet control input can generate Reporting messages for the dimmer rack. This input shall also allow for local connection to a personal computer, providing setup, playback, dimming reporting features, and the ability to load rack-operating software.
 - 2. Two optically isolated DMX512 control inputs. The first input shall accept DMX512 only. The second DMX512 input may be configured to accept DMX512, or Strand Lighting's Vision.net architectural protocol.
 - 3. Optically isolated contact inputs, for external switching interfaces (24V 100ma). These closures are dedicated for:
 - a. PANIC ON Momentary Turns Panic On.
 - b. PANIC OFF Momentary Turns Panic Off.
 - c. FIRE ALARM Maintained Turns Panic On, no Override.

2.7 RACK ELECTRONICS, FEATURES

- A. The rack electronics shall provide two levels of operator interface:
 - 1. A local standard interface that includes 6 menu keys and a bitmapped backlit CD display (minimum 16 character x 2 line) to access standard system menus.
 - 2. A networked customizable Web based interface that includes status displays, configuration and maintenance utilities, integrated on-line help system, and alert emails. Support for wireless PDA's shall allow query and control functions.

SECTION 16570 – DIMMING CONTROL

- B. The dimmer control electronics shall have 16 bit (minimum) fade processing and a dimmer update rate better than 16 ms (60 Hz) or 20 ms (50 Hz). Dimmers set to the same level shall output within +/- .5V of each other, regardless of phase or input voltage, providing the desired level is less than the phase input voltage less the dimmer insertion voltage.
- C. The dimmer output levels shall be regulated for incoming line voltage variations. The regulation shall adjust for both RMS voltage and frequency changes of the incoming AC wave form. Regulation shall maintain the desired output voltage +/- .5V volt for the entire operation range (90 - 264 VAC). The regulation shall compensate for variations of the AC waveform on a dimmer-by-dimmer basis. There shall be no interaction between dimmers in the system or any other equipment. The output shall be regulated to the user programmable maximum voltage level on a dimmer-by-dimmer basis. The processor response time to incoming line changes shall take no more than 16 ms (60 Hz) or 20 ms (50 Hz). Dimming systems that do not respond to line voltage and frequency variations shall not be acceptable.
- D. The control electronics shall allow the maximum output levels of individual dimmers to be adjusted, e.g. to compensate for load circuit voltage loss. The selected dimmer curve shall regulate so that the curve is proportional to the programmed maximum voltage.
- E. The RPM shall also have the capability to support dimmers of different types and sizes that may be mixed throughout the rack. Individual dimmers may be dimmed or switched (non-dim). The individual phase control or switching of positive and negative line voltage half cycles shall not be acceptable, as the net resultant DC line current may damage or degrade line supply transformers.
- F. As a standard, dimmer rack status reporting shall report the following conditions/data:
 - 1. Rack input line voltage per phase.
 - 2. DMX512 Port A input fail.
 - 3. DMX512 Port B input fail.
 - 4. Phase failure (A, B and C).
 - 5. Rack temperature.
 - 6. Rack overtemp warning (100 degrees Fahrenheit.) (37 degrees Celsius).
 - 7. Rack overtemp shutdown (105 degrees Fahrenheit.) (40 degrees Celsius).
 - 8. Rack under temp shutdown (32 degrees Fahrenheit) (0 degrees Celsius).
- G. IGBT dimmer modules shall be fully status reporting as a standard. Optional Dimmer Reporting Cards (DRC) can be factory installed into a standard SCR dimmer modules. All status reporting dimmers and shall report the following conditions/data:
 - 1. Dimmer type in slot. (Dimmer dipswitch set at factory).
 - 2. Load (Wattage) per dimmer.
 - 3. Deviation from recorded dimmer load.
 - 4. No dimmer load.
 - 5. Excess DC on dimmer.
 - 6. Overload on dimmer.

SECTION 16570 – DIMMING CONTROL

7. Power device failure (short circuit or open circuit).
 8. Circuit breaker open.
 9. Dimmer fault.
 10. Change in dimmer type fitted.
 11. RMS Phase current per rack phase.
 12. Dimmer module temperature (w/module shutdown on and over temperature condition).
 13. Forced on at dimmer module.
 14. Dimmer panic.
- H. The control electronics shall provide the following setup functions that shall be user programmable on a per rack or system wide basis:
1. DMX512 Port A patch.
 2. DMX512 Port B patch.
 3. Architectural controls for Vision.net control systems.
 4. Set rack and circuit ID's (CID).
 5. Dimmer reporting enable/disable. (By dimmer module).
 6. Set dimmer level (%).
 7. Set dimmer maximum voltage (12V - 260V in 1V steps).
 8. Set SCR dimmer maximum voltage (24V - 260V in 1V steps).
 9. Set dimmer minimum level (0 to 99%).
 10. Set dimmer curve.
 11. Set dimmer response time.
 12. Set control input priority logic.
 13. Set status reporting parameters.
 14. Program user curves.
- I. The DMX512 Port A and B patching shall support a rack start address and individual dimmer patch. The architectural patch shall define the rack circuit/room/channel relationship for Vision.net control systems.
- J. The control electronics shall provide a facility to disable the output of any individual dimmer by setting the level to 0. It shall also be possible to enable and disable dimmer status reporting on a per dimmer basis.
- K. The control electronics shall contain Vision.net user programmable presets, a permanent blackout preset (preset 0) and a user-definable power up preset. It shall be possible to record individual preset crossfade times, including preset 0. The presets shall be user programmable as a snapshot of the current dimmer outputs resulting from all dimmer control sources according to selected control logic, on a per rack or system wide basis. Each preset may have an individual crossfade time between 0 seconds and 60 minutes.
- L. The control electronics shall support a user assignable "control lost" Vision.net preset. Each rack shall, in the event of loss of control signal according to the selected port logic, maintain the last levels for a user programmable period ranging from 0 seconds to 60 minutes. After this time period it shall automatically fade to the "control lost" preset. Alternatively it shall be possible to program the rack to indefinitely hold the

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last dimmer levels. It shall be possible to continue control without an active control signal using any of the architectural presets. Time resolution to be a minimum of one second.

- M. The processor shall provide an architectural Vision.net control system preset capability of 125 channels for each of 255 separate rooms with programmable fade times. Time resolution to be a minimum of one second.
- N. The system shall provide the ability to set one or a group of dimmers to any level.
- O. The control electronics shall provide the ability to set a library or user programmable 100-point curve (processor to apply a linear interpolation between the user points) to any individual dimmer. Library curves shall be:
 - 1. Square curve.
 - 2. S-curve.
 - 3. Linear power output curve.
- P. User selectable curves shall be:
 - 1. Non-dim (switched) with a programmable trigger level 0 - 99%.
 - 2. Electronic ballast fluorescent curve with a kick-start voltage and user programmable top set and bottom cut-off point.
 - 3. Magnetic ballast fluorescent curve with user programmable top set and bottom cut-off point.
 - 4. Five user defined programmable curves, programmed with up to 100 steps. The processor is to apply a linear interpolation between the user points.
- Q. Each dimmer shall have one of three user programmable response (rack will fade to the new target level in the defined response time) in order to optimize lamp filament life and speed of operation:
 - 1. Fast (30 ms).
 - 2. Normal (100 ms).
 - 3. Slow (300 ms).
- R. The system processor shall provide a number of user programmable control logic schemes, regulating the logical relationship between dimmer control sources. It shall be possible to set the way in which various control inputs interact with each other to create priorities between all control inputs.
- S. It shall be possible to load new rack operating software via the Ethernet connection to the dimmer rack. There shall be no requirement to turn power to the rack off during the loading of rack software, and in addition the Panic facility and Redundant Tracking Backup (RTB) processors shall be fully operational during software loading to the active processor. It shall be possible to load new rack operating software into the processor, regardless of the state of the program storage.

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2.8 DIMMER MODULES

- A. The dimmer modules shall be designed using advanced, state-of-the-art components specifically for entertainment lighting. IGBT dimmer modules for 120 volt applications shall be available in dual 20 amp and single 50 amp configurations. SCR Dimmer modules for 120 volt applications shall be available in single 20 amp 3 wire fluorescent, dual 15 amp, dual 20 amp, single 50 amp and single 100 amp configurations. Modules of similar types shall be interchangeable allowing systems with both SCR and IGBT dimmers to be configured freely. Systems that do not permit the mixing of SCR and IGBT dimmers shall not be accepted.
- B. The dimmer modules shall be designed using advanced, state-of-the-art components. The dimmer module shall be capable of "hot patching" cold, incandescent loads up to its full rated capacity without malfunction with the control signal at full ON.
- C. All single and dual dimmer modules shall be available with optional dimmer status reporting.
- D. The dimmer modules shall be fully plug-in and factory wired. Dimmer modules shall be of rugged and heavy-duty construction enclosed by a formed aluminum chassis. Power and signal pins shall be recessed in a self-aligning housing to avoid handling, storage, and insertion damage. A contoured handle shall be provided for ease of insertion and withdrawal. All chassis parts, except heat sinks, shall be properly treated, primed and finished in fine texture, scratch resistant, coating. Each module shall be labeled with the Philips Strand Lighting logo and rating. Modules constructed of molded plastic for structural support shall not be acceptable. Dimmer modules shall be ETL and cETL listed and CE marked devices.
- E. Dimmer modules shall be keyed so that dimmer modules of greater capacity shall not be interchangeable.
- F. Non-Dim modules shall be available to provide dedicated non-dim circuits not employing SSR devices. Dual modules shall be available providing non-dim/non-dim configurations. Each non-dim shall be provided with a primary circuit breaker of the appropriate rating. Non-dims shall be designed so they can be used for inductive loads.
- G. IGBT dual dimmer modules shall be available with current ratings of 20 amps. IGBT single dimmer modules shall be available with current ratings of 50 amps. Each module shall offer full dimmer status reporting to match all other modules in the C21 Advanced Technology product family. IGBT Dimmer modules shall be fully interchangeable with standard SCR dimmer modules of the same current rating and may be used in systems with standard SCR dimmers. They shall conform to the following specification:
 - 1. The insertion loss (voltage drop across the complete dimmer at full load current while producing a full output sine wave) shall be less than three volts RMS. Insertion loss at reduced dimmer loading shall not vary significantly from that

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- produced with a full rated load. IGBT Dimmers with insertion loss greater than three volts RMS at full rated load shall not be acceptable.
2. IGBT dimmers shall regulate dimmer output to within +/- 0.5 volts RMS of the assigned setting. Regulating response shall occur in the same power line cycle as the disturbance when the dimmer is in Reverse Phase Control (RPC) mode.
 3. IGBT dimmers shall not use zero cross detection to synchronize to the power line. Dimmer output voltage shall be unaffected by severely distorted or noisy power line waveforms.
 4. IGBT dimmers shall automatically switch from Reverse Phase Control (RPC) mode to Forward Phase Control (FPC) mode when inductive loads are detected. In RPC mode the dimmer is on from the beginning of the half-cycle until the desired output voltage is reached. In FPC mode, the dimmer turns on within the half-cycle and stays on until the end of the half-cycle. Use of RPC mode, when load type and other conditions permit, reduces the level of lamp filament noise. IGBT dimmers may also be user set to FPC or RPC modes for LED luminaires.
 5. LOW HARM mode shall reduce harmonic currents present on the feed neutral conductor by automatically switching the dimmers in the system to an optimum configuration of FPC and RPC operation. The reduction in neutral current shall be a minimum of 33% with a maximum of 100%, depending upon load sizes and their associated levels.
 6. Each IGBT dimmer will detect operating conditions and take active measures to protect itself (and the load). Protective measures shall include, but are not limited to the following:
 - a. At power-up, each dimmer will detect excessive line voltages. When over-voltage is detected, the dimmer will not turn on its load. Dimmers shall withstand line voltages up to 230 VAC for an indefinite period and up to 280 VAC for fifteen minutes with no damage.
 - b. Each dimmer shall detect excessive heat sink operating temperatures and automatically reduce its own "fall time", which minimizes the production of heat.
 - c. Each dimmer shall detect load current in excess of its own rating. An overload will cause a dimmer to shut down.
- H. Each dimmer module shall contain circuit breakers, associated solid state switching modules, filters, power and control components.
- I. Standard dimmer electronics shall be completely solid state. They shall utilize two silicon controlled rectifiers in a back-to-back electrical configuration. The full load of the circuit is to be carried and controlled by the silicon controlled rectifiers.
- J. Each 120 volt dimmer shall be protected by a single pole fully magnetic circuit breaker of the appropriate current rating and 10,000 AIC surge rating mounted on the face plate of the dimmer module so that the trip current is not affected by ambient or rack temperature. The circuit breaker shall be rated for tungsten loads having an inrush rating of no less than 20 times normal current and shall disconnect the power to the dimmer module before damage can be done to the dimmer power components. The circuit breakers shall be rated for 100 percent switching duty applications and shall be UL, and cUL marked devices.

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2.9 DIMMER MODULE POWER DEVICES

- A. SSR power devices shall be encapsulated, epoxy filled high impact plastic cases with optically isolated firing circuits, control circuitry, and two silicon controlled rectifiers (SCR's). There shall be a minimum of 2,500 (4,000 in 50Hz systems) volts RMS of isolation between the AC line and the control lines of the SCR. The SCR shall be in an industry standard format that is easily field replaceable without removing any other electrical or electronic devices.

2.10 SCR POWER DEVICE FILTERING

- A. Each SCR power device dimmer module shall have an integral inductive filter to reduce the rate of current rise time resulting from the SSR switching on. The filter shall limit objectionable harmonics, reduce lamp filament sing and limit the radio frequency interference on line and load conductors.
- B. Basic Rise dimmers shall have a rise time of not less than 350 microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 420 millivolts per microsecond in any point of the wave under full load conditions.
- C. Medium rise time dimmers shall have a rise time of not less than 500 (250 at 50Hz) microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 300 millivolts per microsecond in any point of the wave under full load conditions.
- D. Hi-Rise dimmers shall have a rise time of not less than 800 (400 at 50Hz) microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 210 millivolts per microsecond in any point of the wave under full load conditions.
- E. IGBT dimmers shall have a rise time of not less than 1000 microseconds measured at 90 degrees conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load. Voltage rate of rise (slew rate) must not exceed 210 millivolts per microsecond in any point of the wave under full load conditions.

2.11 STRAND LIGHTING C-21 SOUND SUPPRESSION DEVICE

A. GENERAL

- 1. The C-21 Sound Suppression Device (SSD) shall be utilized with C-21 full (48 Module) and half (24 Module) dimmer racks which employ part numbers 75502/120, 75502/120-M, 75502/120-PL, 75503/120, 75503/120-M, 75503/120-PL, 75504/120, 75504/120-M, 75504/120-PL, 75512/120, 75512/120-M, 75512/120-PL, 75513/120, 75513/120-M, 75513/120-PL, 75502/230, 75502/230-M, 75503/230, 75503/230-M, 75512/230, 75512/230-M, 75513/230, and

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75513/230-M all of which utilize the top fan mounting and or C-21 Racks built after June 8,2011. The SSD shall reduce fan noise by altering the venting of the fan with an enclosure lined with sound absorbing foam.

2. The SSD shall decrease the SPL levels and pitch of the C-21 racks.
3. The SSD shall not affect the overall control and module cooling needed for “at load” constant operation.
4. The SSD shall not need any field alteration of the rack and shall be able to be sold as an aftermarket installation kit, therefore any rack changes that are necessary must be made prior to in the factory.

2.12 MECHANICAL

- A. The SSD shall be constructed of steel and finished to match the current line of C-21 hardware of which all part numbers are notated above.
- B. The interior of the device shall be lined with a minimum of 0.5” (12.7mm) Soundmat or Dyna-mat PB-embossed foam insulation.
- C. The SSD shall mount to the current doors of all the part numbers noted above.
- D. The SSD shall be able to be installed with a phillips #2 screwdriver and 5/16” socket or wrench.

2.13 SERIES 6500, UL1008, 120V EMERGENCY LIGHTING TRANSFER CABINET SPECIFICATION

- A. General Overview.
 1. The Emergency Lighting Transfer Cabinet shall provide automatic transfer of both the phase and neutral legs of each branch circuit from normal to emergency power when normal power fails. The cabinet shall automatically reconnect circuits to normal power when normal power has been restored.
 2. The transfer cabinet switches shall be electrically operated and mechanically held. The entire assembly shall be UL1008 listed and labeled. This equipment must comply with the regulations in NFPA 110 for Emergency and Standby Power Systems.
 3. The Emergency Lighting Transfer Cabinet must satisfy the requirements of the following NFPA 70 (National Electric Code).
 - a. Article 701 - Legally Required Standby Systems.
 - b. Article 700 - Emergency Systems.
 - c. Article 540-11c - Motion Picture Houses.
 - d. Article 520-7 - Theatres and Similar Locations.
 - e. Article 518-3c - Places of Public Assembly.
- B. The Emergency Lighting Transfer Cabinet shall be a wall-mounted, NEMA 1 enclosure constructed of 14-gauge steel finished in ANSI 61, gray powder coat paint. All terminations and wiring shall be accessible via a hinged lockable door. The

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cabinet shall be pre-wired and tested at the factory with clearly marked terminals for contractor wiring of normal feed, emergency feed, lighting loads and sensing feeds.

- C. Standard transfer relays shall be available at 20A and 50A current ratings.
- D. The Emergency Lighting Transfer Cabinet shall accommodate circuits of two wire, dimmed incandescent or fluorescent lighting as well as three wire, dimmed, fluorescent lighting.
- E. Emergency Lighting Transfer Cabinets with Type 3 emergency power feeds shall provide for power distribution and branch circuit protection internally for all emergency power circuits.
- F. The front panel of the Emergency Lighting Transfer Cabinet shall contain a key-switch to simulate power failure for testing purposes as well as indicator lights to visually signal the presence of normal or emergency power.
- G. Voltage sensing of the Normal source shall cause automatic transfer when the voltage of one or more phases drops below 55% of 120VAC.
- H. Factory default settings for time delay of transfer are as follows: Normal to Emergency - 0 Seconds, Emergency back to Normal 3 Seconds. These settings shall be field adjustable.
- I. Provisions for optional remote signal, fire alarm and other input signals shall be incorporated into the control circuit.
- J. Provide Emergency Lighting Transfer Cabinets as manufactured by Stagecraft Industries, Inc.

2.14 PRESETPALETTE II MEMORY CONSOLE SPECIFICATION.

- A. General Description.
 - 1. The lighting control shall be a Strand Lighting presetPalette II lighting console with either 64 sliders and 16 submasters for the 32/64 model or 96 sliders and 32 submasters for the 48/96 model. All controls shall be microprocessor based and specifically designed to provide complete control of stage, studio and entertainment lighting systems.
 - 2. An open architecture system using non-proprietary interfaces to permit upgradeability shall be used.
 - 3. All control consoles shall be CE marked, ETL and cETL listed.
 - 4. The console shall consist of a single enclosure with fully integrated processor. All components within the console housing shall be plug in modules with simple connections to facilitate service support and exchange.
 - 5. The system shall use a Microsoft operating system to provide a stable graphical user interface.
 - 6. The lighting control console software shall feature a familiar and easy-to use Windows graphical user interface (GUI) based on the Windows operating

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system. Software features shall include Off-line Editor, Remote Video, Media Player, Web Browser, and PDF Reader.

7. The dedicated Windows processor architecture shall deny access to operating system, but shall allow access to an open hard drive for show files. Processor back up shall be supported by the use of any Windows XP, or later, computer running the PC version of the lighting control console software.
8. The lighting control console shall feature a flexible hardware and software design. Control channel counts, automated lighting support, help files, and additional control hardware shall be easily upgradeable.
9. Minor revisions of operating software and an off-line editor shall be available to the user via download from the manufacturer's web site at no additional cost. Console software shall be upgradeable in the field via Internet download.

B. Capacities.

1. The console shall provide direct control of up to 1024 DMX512 devices (16,384 via the network) via the channel capacity of the console. This channel capacity starts at 100 channels and shall expand to 3000 channels with channel upgrades as purchased. These upgrades can occur at any time. A channel may control either intensities or intelligent parameters of scrollers and automated luminaries. For maximum flexibility in configuration and future upgradeability console hardware and software shall be available separately.
2. A show file may contain an unlimited number of cues, groups, submasters, submaster pages, effects, macros and one fully proportional patch that can be stored on an internal hard disk drive and archived to standard USB memory key drives.
3. Multiple show files and backups shall be stored on the system hard disk.

C. Control Interface.

1. The main control shall consist of a numeric keypad, dedicated control keys, context sensitive soft keys, channel control wheel and pointing device for moving light positioning.
2. Control commands shall be accepted as either command line or direct entry.
3. One hardware playback, "dipless" crossfade preset masters and time adjustable sliders shall be provided, with a go button and dedicated control keys. Additional unlimited virtual playbacks are available via the graphical user interface. Interaction of the playback shall be user programmable as highest level or latest action takes precedence. The playback shall operate in automatic, manual fade or manual time modes.
4. The system shall support fully independent cue lists, one of which is directly controlled using the hardware. The remaining cue lists are virtual and can be controlled using the mouse or keyboard. Tracking and Cue Only modes of operation shall be supported.
5. Each of the 16 or 32 submasters (depending on model) shall be individually programmable as normal, last takes precedence, inhibitive or independent with programmable split up/down fade times, attribute times, and text labels recordable per page.

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6. Advanced functions may be assigned to the submasters, providing firing of macros, cue lists and mastering of DMX512 inputs.
 7. The system shall support two high resolution LCD displays (minimum 1280X1024) for the display of levels, cues, submasters, groups, effects, set-up & patch screens. The displays shall be graphical and support a wide range of user definable screen layouts.
 8. The primary monitor shall be able to support an ELO series touch screen for touch screen functionality. A system that does not support a touch screen shall not be acceptable. Touch functionality includes channel selection, playback functionality, display selection, cue, sub, group and effect editing as well as softkey access.
 9. Attributes shall be excluded from inappropriate masters and shall combine on a latest action takes precedence basis.
 10. An alphanumeric keypad for text labeling shall be provided.
 11. Software and hardware for dimmer reporting, designer's remote, remote video, and Ethernet networking shall be available.
 12. A pointing device shall be provided to access all moving light functionality, including X/Y axis for positioning.
 13. Attributes shall be user selectable and controlled using the soft keys and wheel or the mouse in combination with on screen graphical controls.
 14. Connectivity options shall allow the control console to communicate to Strand's Vision.net architectural control system via RS232. A PaletteOS console can display the PaletteOS software on a Vision.net touch screen. The control console shall connect to an external Windows computer over an Ethernet network in order to facilitate triggering a PowerPoint presentation.
- D. Operating System Overview.
1. Palette software updates shall be user installable from a USB Key.
 2. Channel and attribute capacity shall be software upgradeable at any time, to the maximum capacity of the console.
- E. System Interface List.
1. Two Video Outputs (2).
 2. USB connectors (minimum of 2 on back panel, 1 on front panel).
 3. Serial Data port (COM1).
 4. Two DMX512 Dimmer Outputs (2).
 5. Mains Power Input from the external power supply.
 6. Ethernet 10/100/1000 Base-T.
- F. Console Physical & Electrical.
1. The console controls and electronics shall be a desktop configuration and shall use an Intel microprocessor.
 2. The console shall be constructed of steel with an aluminum face panel. All internal control components shall be fully modular to permit simple removal and exchange. The front panel shall be hinged to permit easy access. Mouse and keyboard ports shall be provided on the back panel of the console.

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3. The central processor shall be fully integrated into the main console in a separate enclosure for rapid removal and exchange. The processor shall include a 80GB hard disk drive (minimum), standard computer I/O and an integrated USB hub for connection of all console control electronics to the system processor.

G. Operational Environment.

1. The acceptable ambient operating temperature shall be 0 degrees to 50 degrees Celsius (32 degrees to 122 degrees Fahrenheit) and the ambient storage temperature shall be -40 degrees to 70 degrees Celsius (-40 degrees to 158 degrees Fahrenheit).
2. The acceptable operation location shall be the equivalent of a good office environment, without excessive dust.
3. Acceptable humidity levels for operation shall be 5% - 95%, non-condensing.

H. Standards Compliance.

1. The console shall be CE marked and ETL, cETL listed.

2.15 PALETTE OPERATING SOFTWARE.

A. Operating System.

1. The system software shall be a true 32-bit multi-tasking operating system. Programs using a 16-bit operating system shall not be acceptable. The software shall be user selectable for Tracking style operation or Cue Only style operation. A fully graphical interface shall be standard.

B. Channel Control.

1. Selection: Channel control lists shall be composed of any combination of control channels, cues, looks or groups using the +, -, Thru & Thru-on syntax. Any one selection shall be capable of being manipulated for level, color scroller & moving light control without the need to re-select. Mouse selection via the Graphical User Interface shall be available.
2. Intensity Control: Intensity levels shall be set using the '@' key and inputting a numerical level or adjusted using the level wheel. Context sensitive soft keys with labels available on the system monitor or hard keys shall be provided for Full, DMX512 level, +%, -%, Off, Copy and Move. Level change shall also be available via the wheel mouse provided.
3. An On key with user definable levels shall be provided.
4. Commands: Command entry shall be user selectable between command line (RECORD CUE 1 * [ENTER]) and direct entry (CUE 1 RECORD). Consoles that do not provide both methods shall not be acceptable.

C. Cues.

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1. The console shall default to tracking cue recording or cue only recording based on operational preference. This shall be set during the initial configuration of the system when the system is started for the first time.
 2. Each cue may have split fade & delay times, a follow time, link & loop parameters, calls for macros & effects, a text label and may be assigned to any cue or cue list.
 3. Cue zero shall always be a blackout cue by default.
 4. Cues shall have up to 26 parts.
- D. Recording & Updating.
1. Cues, groups, submasters, palettes, macros, & effects shall be recorded or updated from the keypad.
- E. Playbacks.
1. Playbacks shall be provided (one hardware playback and unlimited virtual playbacks), with a Go button, dedicated stop/back, and select keys. Interaction with the playback shall be user programmable as highest level or latest action takes precedence operating from separate cue list. The playback shall operate in automatic, manual fade or manual time modes executing fades while following links, loops and macros.
 2. The playback faders shall provide rate override of fades.
 3. Q Only and Tracking modes of operation shall be supported.
- F. Effects.
1. Dynamic, fading and tracking FX parameters shall be supported.
 2. Chase and build effect types shall be supported as shall forward, reverse, bounce and random directions.
 3. Levels and attributes shall be recorded or shall be randomly generated or inverted or alternatively normal and inverted every cycle.
 4. Modifications to running effects may be returned back to the effects memory for re-recording.
- G. Cue, Submaster and Effect Previews & Cross Reference Screen.
1. Cue and submaster preview modes shall be supported to permit blind changes to be made to these entities using channel control syntax.
 2. A Cross Reference screen shall provide an alternative view of cues by showing levels recorded in a range of cues.
 3. Changes may be tracked or restricted to one cue using the Cue Only option.
- H. Submasters.
1. Unlimited pages of fully overlapping submasters shall each be provided each with a fader, virtual fader, bump button and status LED's.
 2. Each submaster shall be individually programmable as normal, last takes precedence, inhibitive or exclusive and text labels recordable per page.

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3. Bump buttons may be individually enabled, disabled, latching or trigger macros.
 4. Submasters shall be loadable with the contents of cues, groups, other submasters or channel lists.
- I. Groups.
1. Groups may be recorded for fast recall of commonly used stage looks. Groups can be independently recorded or directly recorded from the stage output. Cues recorded using preset focus groups may be easily edited and changed by simply updating the focus groups.
 2. Each group may be assigned a text label.
- J. Display Formats.
1. User programmable channel display formats shall be provided to show channel levels, colors, and attribute information. User programmable channel formats shall be provided to show channels in show, defined channels or active channels. Screens shall be fully adjustable using the systems fully graphical user interface.
 2. On screen controls shall be provided for programming moving light attributes using the supplied system input device.
- K. Patch.
1. A proportional soft patch shall be provided.
 2. Dimmers may be profiled, set with a non-dim trigger value, or un-patched at a level.
 3. A library of luminaries to simplify patching shall be provided.
 4. Patch displays shall be ordered by channel or by output.
- L. Profiles.
1. Profiles may be applied to dimmers or up/down fades in cues or parts.
- M. Set-up.
1. Simple to use set-up screens shall be provided to configure external communications and operation of the console.
- N. Macros.
1. Macros may be activated by, submaster's bump button, from a cue, external switch contact, remote control, console power-up or at pre-programmed times.
- O. Archive.
1. Automated Show archive shall be supported to the systems internal hard disk, a USB key drive, or optional file server. This is configured by the user to occur as often as every 1 minute.

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2. The File control drop down menu shall provide a means to select the current show from the system disk or file server and to copy a show (or any part of a show) to or from a USB key drive, or the file server.
3. Shows shall have text labels and a time and date stamp.
4. The system software shall support the loading and saving of database files formatted in the Strand Palette Format (.SPF), data structure and the importing of the Strand Show File (.SSF) data structure. The Strand Show File data structure provides the Palette with backwards compatibility for any 300, 400 or 500 series Strand Lighting control console.

P. Printing.

1. The system shall support Portable Document Format (.PDF) printing.
2. The following printouts may be requested: Patch, Cues, Groups, Subs, Profiles, Macros, Fixtures, Channels in Use, and Channels Not In Use.

2.16 PERIPHERALS.

A. Supported Peripherals.

1. Support shall be provided for the connection of up to five wireless handheld remote controls or one wired remote.
2. Additional peripherals, such as remote shall be supported through the integration of additional optional equipment.

2.17 SYSTEM SOFTWARE.

A. Channel Capacity Software Upgrades.

1. Channel and attribute capacity shall be upgradeable via software to the maximum capacity of the console in 128 or 512 channel increments.

B. Automated Luminaire Control.

1. The system shall provide intelligent control of any DMX512 automated luminaire. The console shall display automated luminaire attributes as true attribute definitions not as channels or DMX512 values. An automated luminaire shall be addressed to a single fixture control channel not a series of consecutive control channels. Consoles that use consecutive control channels or DMX512 percentage values to operate automated fixtures shall not be acceptable.
2. The Fixture Attributes display shall show fixture number, model, mode, and attribute settings displayed in values of colors, degrees, percentages, hertz, and RPMs, not in DMX512 percentages or channel levels.
3. All attributes of an automated luminaire (intensity, color, gobo, focus, X-Y position, effects, CMY, RGB, etc.) shall be accessed by typing one channel number.
4. The system shall use an abstract fixture library for patching and control of automated luminaires.

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5. PaletteOS's abstract control allows for all parameters to be controlled in a user-friendly abstract format. Pan and Tilt shall be adjusted in degrees. Color shall be adjusted using Color Space Control. Gobo parameters like rotation shall be adjusted in RPM speed. Zoom shall be adjusted in degrees. Other parameters shall have similar and consistent parameter control. Console software not using an abstract format shall not be acceptable. Console software only using a partial abstract format shall not be acceptable.
6. Color Frame Control: Full color frames shall be selected using palettes. Part frames may be adjusted using the rotary control wheels. Preset focus groups shall be available to permit the recall of specific colors from scrollers.
7. Color Space Control: For control of color mixing units, it shall be possible to use CMY, RGB, HSL or HSV color mixing methods to select colors. An on screen, user selectable, color picker shall be provided. Consoles that do not provide CMY, RGB, HSL and HSV color mixing shall not be acceptable.
8. Individual attributes shall also be selected from soft keys and the scrolling wheel in conjunction with on screen controls showing attribute names.
9. Displays shall be provided which show all attributes of a fixture.
10. Attributes shall be excluded from inappropriate masters and normally operate in latest action takes precedence fashion within submasters, playbacks and effects.
11. When attributes and levels are recorded in a submaster the levels shall be mastered by the fader but the attributes shall go to their recorded value in a latest takes precedence basis to ensure that scenes played back on submasters can be faded in and out with recorded colors and positions. Attributes shall have the option of moving when the fader is moved off of zero, when the fader reaches full or manually.
12. Cue tracking shall be supported for attribute channels.
13. A channel and attribute cross-reference screen shall be provided for blind viewing.
14. Move In Black shall provide an optional automatic means of moving fixtures to the next required position (pan, tilt, color, gobo, etc.) after the previous fade has completed and when the fixture intensity is zero without the need to record extra cues.
15. A library of over 900 automated luminaires with text labels shall be provided to facilitate fast patching.
16. Unlimited preset focus groups shall be provided to simplify the programming of automated luminaires.

C. Remote Communication.

1. A programmable RS232 remote cue go output shall be available for triggering external devices. Output format shall be standard ASCII format for interfacing to a wide range of external devices and computers.
2. The console software shall also support communication with other computer programs running on other computer systems including WYSIWYG and PowerPoint presentation software.
3. The console software shall support communication with openPalette applications. OpenPalette applications are written as third party applications to communicate with the PaletteOS to provide additional functionality. OpenPalette applications can run from the console or from a networked PC computer.

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- D. Ethernet Network Operation.
 - 1. The system shall support full Ethernet connectivity to system dimmer racks and remote peripherals using the built in Ethernet port on the console. Protocols that shall be available are ShowNet, CKNet, Artnet, Pathport and ANSI E1.31. This is in addition to direct DMX512 connectivity.
 - 2. The system shall support industry standard 10/100Base-T cables, Ethernet hubs and switches.

- E. Wireless Remotes.
 - 1. Up to five (5) wireless handheld remote controls may be connected to the system using a Wireless access point.
 - 2. Multiple access points may be provided to supply adequate coverage throughout a facility.

- F. Tracking Backup.
 - 1. Two consoles may be configured and operated as main and tracking backup.

- G. Remote Console.
 - 1. Up to five (5) additional consoles or PCs running Windows XP, or later, shall be able to connect to the Main console as a Remote Console over an Ethernet network.

- H. Remote Video.
 - 1. Up to five (5) PCs running the PaletteOS shall be able to function as a Remote Video device over an Ethernet network.

- I. Off-Line Editor Software.
 - 1. A Windows hosted off-line editor shall be available which shall enable show files to be edited and simulated in real time on any Windows XP or later PC.
 - 2. All facilities of the console, including patching, channel control, playbacks, submasters, effects & set-up shall be supported on the off-line editor.

- J. Showfile Compatibility.
 - 1. Any showfile that has been created on a PaletteOS based control console shall be able to load, run, edit and function on any PaletteOS based control console. Any console line that limits or truncates features across the console line shall not be acceptable.

- K. VGA Color Video Monitor.
 - 1. The console shall support computer industry standard VGA color video monitors with a resolution of 1280X1024.

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2. The system shall alternately support an optional ELO series touch screen.
- L. Included Furnishings.
1. The control console shall be supplied with:
 - a. Power cord.
 - b. A high quality dust cover.
 - c. An USB Key for archive storage.
 - d. An ASCII standard computer keyboard
 - e. A standard computer mouse.

2.18 N21 2-PORT DMX512 ETHERNET NETWORK NODE SPECIFICATION.

- A. General Description.
1. The N21 Node shall be an intelligent Ethernet node providing serial data distribution. The 5-pin XLR's on the node may be configured for DMX512 Out, or DMX512 In.
 2. Connections shall be made between nodes over standard Ethernet distribution systems using 10Base-T or 100Base-T wiring. Each Node shall be supplied with an integral LCD display for labeling and status monitoring. It shall incorporate a standard power supply or receive power from a Power over Ethernet (PoE) compatible switch conforming to the IEEE802.3af standard.
- B. Physical.
1. The Node electronics shall be supplied with a back box suitable for flush or surface mounting and a front panel finished in powder coat paint. There shall be no visible fasteners.
 2. There shall 2 DMX512 (512 dimmers per port, selectable In/Out), 5 pin female XLR connectors standard.
 3. An LCD display shall be provided to dynamically label each node and receptacle. The display shall be user configurable using a standard Web Browser.
- C. Electronics.
1. The node processor shall be an industry standard 32-bit microprocessor with an embedded Linux OS and integral 10/100BT Ethernet support.
 2. Configuration of the Node shall be stored in non-volatile memory.
- D. Operational Features.

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1. The Node shall be remotely configured via the network system wiring using a standard Web Browser.
2. The Node shall control up to 1024 DMX512 channels, within the confines of a 36 "universe" DMX512 system. The specific DMX512 channels input or output by the Node shall be freely configurable by the user.
3. Outputs may be created from multiple overlapping sources with up to 3 levels of patch priority.
4. All ports may be configured as a DMX512 input or output.

E. Environmental.

1. The ambient operating temperature shall be 0 degrees to 40 degrees Celsius (32 degrees to 104 degrees Fahrenheit).
2. The storage temperature shall be -40 degrees to 70 degrees Celsius (-40 degrees to 158 degrees Fahrenheit).
3. The operating humidity shall be 5% - 95% non-condensing.

F. Standards Compliance.

1. EMC emissions to EN50081-1, EN55014; EMC immunity to EN50082-1, IEC1000-2-2; Safety: EN60950, EN60439 Part 1 (also part 12 BS5486); design & build: ISO9000, UL1950. Ethernet IEEE.
2. The Node shall be CE UL & cUL listed.

2.19 VISION.NET CONTROL SYSTEM SPECIFICATION.

A. General Capacities

1. The system shall support up to 255 rooms with a maximum of 125 control channels per room, which can be connected to an unlimited number of dimmers, relays, or DMX512 controlled equipment. The control connection between stations and to Strand dimming and relay systems shall be via standard Cat 5e cable using the Vision.net control protocol. For DMX512 applications an optional Vision.net to DMX512 module shall be available.
2. Star wiring shall be supported using any number of available 4 port Vision.net data hubs.
3. Large-scale systems consisting of multiple Vision.net networks may be linked using a Strand Lighting ShowNet Ethernet network.
4. No central processor shall be required. Systems requiring a separate processor shall not be acceptable.

B. Interconnection.

1. Each station shall be connected as an RS485 serial "daisy chain" using Belden 1583A Cat 5e cable.
2. It shall be possible to change standard control stations at any location on the data network without requiring additional wiring or alterations to the wiring

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specification. Touchscreen stations shall require a separate power feed to operate the station electronics.

- C. Vision.net Configuration Interface.
 - 1. The system shall support a digital communications link for station configuration and set up.
 - 2. An RS232 programming station shall be used for connecting a Personal Computer operating Vision.net/Vision.net Design software to the data network.

- D. Vision.net Designer Configuration Software.
 - 1. Designer software shall be a graphical set up and configuration programmed designed to operate under Windows operating systems.
 - 2. An astronomical clock shall be available on any system touchscreen capable of being programmed to any geographical location in the world. The clock shall be able to execute any number of daily, weekly or date specific events at fixed times, or offset relative to sunset and sunrise.
 - 3. The system shall support 125 control channels per room with up to 255 rooms per system. Any number of dimmers may be assigned to a room.
 - 4. Each room shall be capable of having any combination or quantity of control stations.
 - 5. It shall be possible to change stations at any location by replacing it with a different station type, and modifying the systems configuration file accordingly.
 - 6. Each room shall have 32 presets available, regardless of the number of rooms or number of channels within each room. Presets shall be selected from control stations, or shall be "played back" automatically by time clock events. Each preset shall have its own programmable fade, delay and hold time and may be linked for sequential playback in a single sequence, or using system macros a continuous loop if required.
 - 7. Programmable delay, fade and hold times shall be available in the following increments; instant, 1 sec., 2 sec., 3 sec., 5 sec., 7 sec., 10 sec., 15 sec., 30 sec., 1 min., 5 min., 15 min., 60 min.
 - 8. It shall be possible to allocate a name or label to every room, panel, station, preset and group in the system.
 - 9. It shall be possible during system configuration to create macros using a "Smart" button. Smart buttons shall carry out a sequence of standard system commands. It shall be possible to program Smart buttons from any control station pushbutton, remote input or, automatically using the astronomical time clock. It shall be possible to assign any of the system commands to any station pushbutton, external device input, time clock event, or Macro step. Smart buttons shall support if - then commands to allow for extended programming flexibility.
 - 10. In cases where an area is to be divisible for separate or combined control, it shall be possible to combine the constituent rooms either manually or with automatic partition switches. Rooms are combined using a "Room Link" touchscreen button. Rooms that are not linked shall maintain their own presets, levels and channels. "Room Link" coordinates the selection of presets within the combined rooms from any control station within those rooms.
 - 11. The following commands shall be programmable to any system button:

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- a. Preset.
 - b. Preset/Off.
 - c. Toggle.
 - d. Smart.
 - e. Raise.
 - f. Lower.
 - g. Select Map.
 - h. Share.
12. The system shall include an output simulation mode allowing the system designer to test all configurations prior to system installation.
 13. Touchscreen configuration shall be supported with simple drag and drop tab, button, slider, sliders, and text entities.
 14. Tabbed touchscreen pages may be created for:
 - a. Buttons and Sliders.
 - b. Palette Monitor.
 - c. Web Browser.
 - d. Real Time Clock.
 15. Touchscreens may optionally be connected to a Strand Lighting ShowNet Ethernet network to connect to Palette series control consoles or Network control devices. In this mode of operation, it shall be possible to view console pages that display information on Cues, Submasters, Macros, Lamp Check and Channels.
- E. Vision.net Control Stations.
1. The control station faceplates shall be free of visible fasteners and shall be of aesthetic appearance.
 2. Station faceplates shall be fabricated of Lexan polycarbonate plastic.
 3. Control stations shall be supplied in a wide selection of custom colors with white being the default standard.
 4. On control stations with sliders, the sliders shall have 1.75" (45mm) travel with color keyed slider knobs.
 5. Control station push buttons shall have color keyed engravable button caps with long life two color LED backlighting for active indication of a selected function or level backlighting when off or not selected.
 6. Stations shall have modular construction to permit any combination of button keypads or faders up to 4 gangs. Expansion stations shall be available.
 7. Keypads on all buttons stations shall be engravable. Keypads may be exchanged at any time to permit upgrading or changing engraving and keycap colors.
 8. Faceplates shall be die cut to precisely match any and all fader and button combinations required. Faceplate engraving shall be an available option.
 9. Faceplates and key and fader caps shall be color coordinated.
 10. All control stations shall have a unique address between 1 and 255 configured at the initial system start up.
 11. A Vision.net control station may consist of up to, 8 push buttons and 12 sliders for fader operation in channel control or optionally up to 12 submasters.

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12. Expansion modules shall be available to expand the capacity of any stations as required in the system design.
13. Button stations shall be available with an integral IR receiver port for a remote control of any button station.
14. All button stations shall provide inputs for up to 8 occupancy sensors and photocells. A contact closure interface for remote inputs or keyswitches shall also be standard.
15. Control stations require flush mounted masonry ("ears-in") back boxes, with a minimum depth of 3.5" (90mm). Back boxes must be grounded/earthed in accordance with local wiring practices to provide a discharge path to ground for static electricity.
16. Control stations shall be supplied complete with a sub-plate, which is screwed to the flush mounting back box with the screws provided. The sub-plate allows the control station to be hinged into position and secured with hexagonal setscrews on the bottom edge of the trim ring.
17. Data line terminations shall be via a screw-terminal plug and socket to facilitate removing a control station while maintaining the continuity of the data network.

F. Vision.net Slider with Pushbutton Stations.

1. Each station shall have a MANUAL (Take Control) button, which shall give control to the manually operated channel sliders.
2. Stations shall be available with 3, 6, 9, 12 or 15 sliders plus a proportional master. It shall be possible to allocate multiple channels within a room to a single slider.
3. Channels not allocated to a slider shall either go out or remain at the previously selected preset level when MANUAL is selected according to the configuration software.
4. Sliders may also be configured in submaster mode allowing them to operate as group masters.
5. All buttons may be programmed to over write their default settings. Each button may be assigned any of the following functions:
 - a. Preset.
 - b. Preset/Off.
 - c. Toggle.
 - d. Smart.
 - e. Raise.
 - f. Lower.
 - g. Select Map.
6. Smart button commands including room combine, cross room commands and commands to Strand Lighting Light Palette and Rack Palette controllers.
7. Each preset button shall have a push and hold record function, which will allow the current slider settings to be recorded into one of the presets available from the local pushbuttons. Fade, Hold and Delay times for these presets will remain unchanged by this record action. If desired this function may be disabled when a station is configured.

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- G. Vision.net Pushbutton Stations.
 - 1. All button stations shall be fully configurable.
 - 2. Each button may be assigned any of the following functions:
 - a. Preset.
 - b. Preset/Off.
 - c. Toggle.
 - d. Smart.
 - e. Raise.
 - f. Lower.
 - g. Select Map.
 - 3. Smart button commands including room combine, cross room commands and commands to Strand Lighting Light Palette and Rack Palette controllers.
 - 4. Each station shall store all active control information at all times. No central processor shall be required.
 - 5. All buttons shall have blue and amber backlighting LED's. LED's shall be fully programmable with high and low levels to indicate the status of a button and provide back lighting for all button legends.
 - 6. Each station shall have programmable inputs for Photocell or occupancy sensors.
- H. Remote Driver Interface/Relay Driver Interface.
 - 1. Each Interface shall accept up to 8 momentary contact closures at their inputs.
 - 2. In addition to Vision.net data input, the Interfaces shall require an additional 24-volt dc power supply.
- I. Portable Enclosure Kits.
 - 1. Portable Enclosure Kits shall enable standard stations to be converted to portable units. Kits shall be supplied complete with 25ft (8m) cable and mating connectors.
- J. Data Cable Specification.
 - 1. Vision.net stations Belden 1583A Cat 5 cable.
 - 2. DMX512 Belden 9829.
- K. Documentation.
 - 1. An Operations Manual and Installation Instructions are supplied with each system. Project installation & connection drawings shall be supplied as specified.
- L. Environmental Specification.
 - 1. For all control stations and associated equipment, the following recommendations shall apply:

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- a. Ambient temperature extremes: 32 - 104 Degrees Fahrenheit (0 - 40 Degrees Centigrade).
- b. Recommended ambient temperature: 64 - 77 Degrees Fahrenheit (18 - 25 Degrees Centigrade).
- c. Relative humidity: 10% - 90% non-condensing.
- d. General conditions: Office level cleanliness - Interior use only.

2.20 VISION.NET CONTROL SYSTEM SPECIFICATION.

A. System Overview.

1. System shall be a fully integrated digital lighting control system, utilizing digital communications between stations, and the control devices (dimmers, relays, and DMX-512 controlled equipment) in the system as required.

B. General.

1. Capacities.

- a. The system shall support up to 255 rooms with a maximum of 125 control channels per room, which can be connected to an unlimited number of dimmers, relays, or DMX512 controlled equipment. The control connection between stations and to dimming and relay systems shall be via standard Cat 5e cable using the Vision.net control protocol. For DMX512 applications an optional Vision.net to DMX512 module shall be available.
- b. Star wiring shall be supported using any number of available 4 port Vision.net data hubs.
- c. Large-scale systems consisting of multiple Vision.net networks may be linked using a Strand Lighting ShowNet Ethernet network.
- d. No central processor shall be required. Systems requiring a separate processor shall not be acceptable.

2. Interconnection.

- a. Each station shall be connected as an RS485 serial "daisy chain" using Belden 1583A Cat 5e cable.
- b. It shall be possible to change standard control stations at any location on the data network without requiring additional wiring or alterations to the wiring specification. Touchscreen stations shall require a separate power feed to operate the station electronics.

3. Vision.net Configuration Interface.

- a. The system shall support a digital communications link for station configuration and set up.

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- b. An RS232 programming station shall be used for connecting a Personal Computer operating Vision.net Design software to the Vision.net data network.

2.21 VISION.NET DESIGNER CONFIGURATION SOFTWARE.

A. General.

1. Designer software shall be a graphical set up and configuration programmed designed to operate under Windows operating systems.
2. An astronomical clock shall be available on any system touchscreen capable of being programmed to any geographical location in the world. The clock shall be able to execute any number of daily, weekly or date specific events at fixed times, or offset relative to sunset and sunrise.
3. The system shall support 125 control channels per room with up to 255 rooms per system. Any number of dimmers may be assigned to a room.
4. Each room shall be capable of having any combination or quantity of control stations.
5. It shall be possible to change stations at any location by replacing it with a different station type, and modifying the systems configuration file accordingly.
6. Each room shall have 32 presets available, regardless of the number of rooms or number of channels within each room. Presets shall be selected from control stations, or shall be "played back" automatically by time clock events. Each preset shall have its own programmable fade, delay and hold time and may be linked for sequential playback in a single sequence, or using system macros a continuous loop if required.
7. Programmable delay, fade and hold times shall be available in the following increments; instant, 1 sec., 2 sec., 3 sec., 5 sec., 7 sec., 10 sec., 15 sec., 30 sec., 1 min., 5 min., 15 min., 60 min.
8. It shall be possible to allocate a name or label to every room, panel, station, preset and group in the system.
9. It shall be possible during system configuration to create macros using a "Smart" button. Smart buttons shall carry out a sequence of standard system commands. It shall be possible to program Smart buttons from any control station pushbutton, remote input or, automatically using the astronomical time clock. It shall be possible to assign any of the system commands to any station pushbutton, external device input, time clock event, or Macro step.
10. In cases where an area is to be divisible for separate or combined control, it shall be possible to combine the constituent rooms either manually or with automatic partition switches. Rooms are combined using a "Room Link" touchscreen button. Rooms that are not linked shall maintain their own presets, levels and channels. "Room Link" coordinates the selection of presets within the combined rooms from any control station within those rooms.
11. The following commands shall be programmable to any system button:
 - a. Preset.
 - b. Preset/Off.
 - c. Toggle.

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- d. Smart.
 - e. Raise.
 - f. Lower.
 - g. Select Map.
12. The system shall include an output simulation mode allowing the system designer to test all configurations prior to system installation.
 13. Touchscreen configuration shall be supported with simple drag and drop tab, button, slider, sliders, and text entities.
 14. Tabbed touchscreen pages may be created for:
 - a. Buttons and Sliders.
 - b. Palette Monitor
 - c. Web Browser.
 - d. Real Time Clock
 15. Touchscreens may optionally be connected to a Strand Lighting ShowNet Ethernet network to connect to Palette series control consoles or Network control devices. In this mode of operation, it shall be possible to view console pages that display information on Cues, Submasters, Macros, Lamp Check and Channels

2.22 VISION.NET TOUCHSCREEN STATIONS.

A. Specific Features.

1. All Vision.net touchscreens shall be full color displays. Systems that do not support color displays shall not be acceptable.
2. Users may choose either a 7-inch or a 15-inch full VGA display.
3. Each display shall support multiple tabs to allow users to organize their displays to meet a wide range of applications. Tabs shall support the following applications:
 - a. Programmable Sliders that can be scaled and programmed as both channel controls and submasters. Three fader sizes are available allowing system programmers to optimize the number of faders displayed on screen for maximum flexibility.
 - b. Touchscreen buttons shall be available in a variety of sizes and shapes permitting system designers the flexibility to allow buttons to define their function through shape and color.
 - c. All displays, faders, buttons and tabs shall have text labels in a choice of fonts, sizes and colors.
 - d. Real Time clock display with full system programming.
4. Systems with network connections shall also support tabs with:
 - a. Web Browser capability allowing access to Strand ShowNet network devices.

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- b. Remote control and monitoring access to Strand Lighting Palette, Light Palette and Rack Palette control consoles.
- c. Any screen can have a color graphic background to permit a wide range of custom graphic options for system designers. Backgrounds may be any bit-mapped image. Alternately backgrounds may be assigned a wide range of colors.

2.23 AV INTERFACE / RELAY DRIVER INTERFACE.

A. Specific Features.

1. Each Interface shall accept up to 8 momentary contact closures at their inputs.
2. In addition to Vision.net data input, the Interfaces shall require an additional 24-volt dc power supply.

2.24 PORTABLE ENCLOSURE KITS.

A. Specific Features.

1. Portable Enclosure Kits shall enable standard stations to be converted to portable units. Kits shall be supplied complete with 25ft (8m) cable and mating connectors.

2.25 DATA CABLE SPECIFICATION.

A. Specific Features.

1. Vision.net stations Belden 1583A Cat 5 cable.
2. DMX512 Belden 9829.

2.26 DOCUMENTATION.

A. Specific Features.

1. An Operations Manual and Installation Instructions are supplied with each system. Project installation & connection drawings shall be supplied as specified.

2.27 ENVIRONMENTAL SPECIFICATION.

A. Specific Features.

1. For all control stations and associated equipment, the following recommendations shall apply:
 - a. Ambient temperature extremes: 32° - 104° F (0° - 40° C).

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- b. Recommended ambient temperature: 64° - 77° F (18° - 25° C).
- c. Relative humidity: 10% - 90% non-condensing.
- d. General conditions: Office level cleanliness - Interior use only.

2.28 SURFACE/FLUSH MOUNT OUTLET BOX SPECIFICATION.

A. General Description.

1. Surface/Flush Mount Outlet Boxes shall consist of an extruded aluminum enclosure and cover with a minimum wall thickness of not less than .125 inches and a minimum cross section of not less than 5 inches high x 4 inches deep. Unless otherwise specified, enclosure and cover shall be furnished in a low gloss black finish. Enclosure and cover shall be inherently rustproof.
2. Enclosure shall have provisions for an integral internal low voltage barrier.
3. Internal wiring shall be of a minimum 125 degree Celsius cross-link polyester in gauges as required by amperage of specified connectors and receptacles.
4. Internal wiring shall terminate to molded barrier terminal blocks of proper amperage, size and capacity. Terminal blocks shall be clearly marked and identified for incoming field wiring.
5. External circuit identification shall consist of minimum 1 inch high die cut vinyl characters in the color(s) specified herein or as shown on drawings.
6. Enclosure length and circuitry of each outlet box shall be as shown on drawings.
7. Surface mount inlet/outlet box shall be UL listed and labeled for use in the United States and in Canada and marked suitable for damp locations.

2.29 STRAND SELECON PACIFIC ELLIPSOIDAL SPOTLIGHT SPECIFICATION.

A. Overview.

1. The base down Axial Ellipsoidal shall be a 'platform' product designed around a single lamphouse with which a range of specified optical systems and light sources can be used.
2. The lens systems to be available will include but are not limited to:
 - a. 5 Degree High Efficiency, 20, 30, 40, 50 and 90 degree fixed beams.
 - b. 5.5-13, 7.5-19, 12-28, 14-35, 23-50, 45-75 degree Zoomspots.
3. The fixed lenses 20, 30, 40, and 50 degree are to be interchangeable by simply sliding them into the lens tube. Identification of the lens beam angle is to be indicated by the color of the lens holder and lens focus knob.
4. It shall be possible to fit any zoom or fixed lens tube to the same lamp house.
5. The light sources to be available for use in the fixture are to include:
 - a. Main voltage tungsten halogen: 575W, 750W, and 1000W.
 - b. MSR / HMI single ended short arc 575W lamps including - 575/2, 575W Hot Re-strike and 575W MSD (2,000 hr. display type lamp).

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- c. CDM / CMH type short arc long life display lamps - 70W and 150W.
6. A color-coded handle will provide a visual indicator of the lamp fitted in the fixture.
7. The fixture shall incorporate an Active Heat Management System to exhaust heat away from the lamp socket, gate, and lenses. The lamp socket shall be mounted base down out of the heat exhaust. A faceted aluminum reflector shall collect the energy from the light source. A flat dichroic hot mirror shall selectively reflect the visible light beam at right angles into the lens system while allowing the majority of the infrared and U.V to pass out of the fixture through onto an aluminum heat sink. A shield guard incorporated on the back of the fixture covering the heat sink will have a surface temperature of less than 50% of the lamp house.
8. The effectiveness of the heat removal system shall be such that when fitted with a 575W lamp and following the correct procedures, it is possible to usefully use images printed on to a plastic media such as overhead transparency material as image projection.
9. Access to the lamp for re-lamping / maintenance shall be by removal of the lamp module unit mounted on the underside of the lamphouse. It shall not be possible to access the lamp without disconnecting the mains supply. The lamp socket shall be mounted on springs to minimize vibration to the lamp filament.
10. The light distribution shall be adjustable from a true peak (+3 : 1) to a flat field (2 : 1). The design of the lamp module is to allow for the lamp to be set up in position outside the fixture avoiding the need for bench set-ups. The peak/ flat adjustment shall be made using a central planetary gear without the use of tools. It shall be possible to operate the adjustment controls without gloves, even after the fixture has been in operation for several hours.
11. It shall be possible to rotate the shutter gate assembly through a full 360 degrees.
12. An engineering plastic shall be used for the gate assembly to ensure smooth operation of the shutters. It shall be possible to use both an iris accessory and gobo holder accessory concurrently if required.
13. Two separate safety anchor points shall be used, one on the lamp house, and the other on the lens house for accessories.

B. Operational Data.

1. The lens position shall be adjusted by releasing a lamp focus knob, and sliding the lens to a new position. The lens carrier shall be constructed from engineering plastic to ensure no metal-to-metal contact. A numerical scale for focus setting indication shall be provided.
2. There shall be a large plastic handle on the lamp housing for focus positioning. It shall be possible to grip the handle firmly with all four fingers and not touch the lamp housing. When the fixture is not in use, it shall be possible to coil the supply cable inside the handle.
3. The lenses shall be mounted in carriers constructed from engineering plastic. For cleaning and maintenance, the carriers shall slide out of the front of the lens house once the focus knob, color frame and safety mesh have been removed.

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4. It shall be possible to access the reflector and flat dichroic mirror by removing one screw from the lamp house, and lifting out the heat shield and aluminum heat sink.
5. The color frame shall be inserted and removed by one insertion hand. The color frame shall be inserted by releasing color frame retention catch and locating in desired slot. Removal shall be by reversal of the above process.

C. Standards.

1. The luminaires shall be tested and approved to the following international standards:
 - a. EN 60-598-2-17 1989 incl. amendments 1 & 2.
 - b. EN 60-598-1 1992 incl. amendment 1.
 - c. Electromagnetic Compatibility Directive 89/336/EEC as amended by Directive 91/263/EEC and 92/31/EEC
 - d. ETL & cETL listed to U.L. standard 1573

D. Mechanical.

1. The lamp house shall consist of pressure die cast aluminum left and right castings, and a pressure die cast aluminum heat sink. There shall be a heat shield guard over the heat sink. There shall be a lamp module constructed of engineering plastic. There shall be a separate safety anchor point. There shall be a large plastic handle on the lamp housing for focus positioning.
2. The Lens House shall consist of a shutter gate assembly constructed from engineering plastic, a tube in which two plastic lens carriers are mounted, and a front molding constructed from engineering plastic or the complete lens tube molded from an engineering plastic. The shutter gate assembly shall be rotatable through 360 degrees. The front molding shall have runners for a color filter frame and safety mesh or effect accessory. There shall be a separate safety anchor point on the lens house for accessories.
3. The fixture shall have a steel alloy yoke suspension with a ½ inch centre hole, and shall be supplied with a 1/2 inch bolt, nut and two washers for pan adjustment. It shall be possible to reduce the height of the yoke by using the secondary pivot holes on the yoke. Tilt adjustment shall be possible by pivoting the yoke and locked by interlocking cup and disc assembly operated by heat insulated plastic knob. There shall be a tilt reference scale on the disc assembly.
4. The fixture shall have a 99.9% pure anodized aluminum ellipsoidal reflector polished to high reflectivity.
5. The lenses shall be constructed from heat resistant clear borosilicate glass mounted in engineering plastic carriers for smooth focus movement. The lenses shall be optically coated to improve the beam quality.
6. There shall be four non-removable beam shaping shutters constructed from stainless steel alloy, and fitted with ergonomically designed heat insulated operating handles. These shall be mounted within a gate assembly constructed from engineering plastic, which shall be rotatable through 360°. The gate shall incorporate runners for both an iris accessory and gobo holder accessory. There shall be an accessory cover to seal the gate when not in use.

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7. The fixture shall be supplied with a color filter holder.
8. The finish shall be high temperature baked black epoxy powder paint on the aluminum lamphouse sides. The engineering plastic components shall be matt black. The aluminum heat sink shall be unpainted aluminum to aid in heat dispersion.

2.30 STRAND SELECON RAMA 6 INCH FRESNEL SPECIFICATION

A. Overview.

1. The Fresnel fixture shall be purpose designed for performance lighting applications.
2. The Fresnel fixture with integrated safety cable shall be supplied with a hard-tooled color frame and a short form instruction manual for immediate use. A detailed instruction manual shall be available for download from the manufacturer's website.
3. The Fresnel fixture shall comply with ETL and cETL standards and listed to U.L. standard 1573.
4. The Fresnel fixture shall be able to be operated to a maximum power input voltage of 120V.
5. The Fresnel fixture shall be able to use up to a 1000W lamp.
6. The Fresnel fixture shall be supplied with a P28 lamp socket.
7. The Fresnel fixture shall be supplied with a 4-foot long temperature resistant silicon rubber cable. There shall be three conductors of a 1.5mm diameter within. The power supply cable point of entry to the Fresnel fixture shall be a trumpet gland constructed from high temperature resistant engineering plastic. There shall be no direct clamping pressure on the cable, and a separate IEC plug and connector shall not be acceptable. The power supply cable shall be retained by two separate indirect pressure points located within the cable connector compartment.
8. The Fresnel fixture shall not exceed 14 lbs 5 oz in weight including the barndoor accessory and the color frame.
9. The Fresnel fixture shall have the following dimensions:
 - a. Height: 15 15/16 inches.
 - b. Width: 11 7/16 inches.
 - c. Length: 14 9/16 inches.
10. The lamp house of the Fresnel fixture shall have rounded corners and edges with no sharp edges. It shall be constructed from aluminum and engineering plastics.
11. The sides of the Fresnel fixture shall be constructed from extruded aluminum for strength, lower weight and no noise during the expansion and contraction period when the Fresnel fixture is heating up. Sides constructed from sheet metal shall not be accepted. Ventilation of the Fresnel fixture shall be maximized by not less than five convection slots running the entire length of the lamp house.
12. The front and rear of the Fresnel fixture shall be constructed from high temperature and impact resistant engineering plastic moldings for strength, lower

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weight and no noise during the expansion and contraction period when the Fresnel fixture is heating up. Front and rear castings constructed of metal shall not be accepted.

13. There shall be a rear grab handle mounted on the rear of the Fresnel fixture. The grab handle shall be constructed from high heat and impact resistant engineering plastic, and shall have a warning label formed as an integral part of the handle.
14. There shall be a cable connector compartment located on the outside back molding of the Fresnel fixture. The power supply cable shall be terminated in this compartment and not in the main body of the fixture.
15. For ease of service it shall be possible to gain access to the interior of the cable connector compartment by the removal of three screws and the cable connector compartment cover.
16. The paint finish of the Fresnel fixture shall be low reflective, matt charcoal color, electrostatically applied, baked on epoxy powder coat. The finish of all exterior plastic components shall be matt charcoal color.
17. The Fresnel lens shall be 6" in diameter, mounted inside the fixture and fully supported around its entire circumference. Stainless steel springs shall hold the lens in position and allow for movement caused by heat expansion.
18. The Fresnel fixture shall have a spherical reflector, manufactured from 99.99% super pure aluminum anodized and polished to provide a pure specular reflector.
19. The lens and reflector shall be quickly accessed for cleaning without tools in the lamp housing by means of a side hinged bottom tray held closed with a spring clip assembly. It shall possible to clean the lens and reflector of the Fresnel fixture without altering the set focus position.
20. The Fresnel fixture shall comply with the following performance specifications when using a BTR 1000W 120V 27,500 lumens lamp:
 - a. Beam Angle: (2:1 variation from centre peak) 7-50 Degrees.
 - b. Minimum Light Output: 7 Degrees - 165,600 Candela, 50 Degrees 17,640 Candela.

B. Operation.

1. The Fresnel fixture shall be panned by loosening the yoke nut and bolt, twisting the yoke to the desired position, and tightening the yoke nut and bolt.
2. The Fresnel fixture shall incorporate a locking clamp disc and knob for tilt operation. The operator shall be able to loosen the tilt-locking knob, tilt the Fresnel fixture and then lock the Fresnel fixture in place.
3. The focus fastening system shall be by a simple heat resistant low maintenance screw knob. A focus reference scale to record the focus position is to be provided.
4. The Fresnel fixture shall have reference scales on the axis of movement to comply with stage lighting visualization software packages. Tilt reference scale with degrees marked in increments from the centre line of the fixture. Focus reference scale with the beam angle degree marked in increments from 7 to 50 degrees.
5. It shall be possible to access the lamp of the Fresnel fixture without the need of tools and without altering the focus position of the fixture or the barndoor

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- accessory. Lamp access that alters the focus position of the fixture or the barndoor accessory shall not be accepted.
6. The lamp access shall be by means of a side hinged bottom tray held closed with a spring clip assembly. The hinge design shall be incorporated in the shape of the lamp house side extrusion, and shall run the length on the lamp house for strength and rigidity.
 7. The mains power shall be automatically disconnected when the lamp access tray is opened.
 8. The Fresnel fixture shall incorporate an integral safety cable that shall be able to be retracted into the fixture when not in use. The safety cable shall be rated for the weight of the fixture.
 9. It shall be possible to adjust the balance of the Fresnel fixture by repositioning the yoke as required along the length of the fixture. There shall be a balance point marked on the focus reference scale.
 10. The Fresnel fixture shall have three accessory slots for positioning of a safety mesh, color frame and barndoor accessory. The accessories shall be retained in the Fresnel fixture with an accessory slot cover. A spring retention clip shall not be accepted.

2.31 STRAND SELECON RAMA 6 INCH PC SPECIFICATION.

A. Overview.

1. The PC fixture shall be purpose designed for performance lighting applications.
2. The PC fixture with integrated safety cable shall be supplied with a hard-tooled color frame and a short form instruction manual for immediate use. A detailed instruction manual shall be available for download from the manufacturer's website.
3. The PC fixture shall comply with ETL and cETL standards and listed to U.L. standard 1573.
4. The PC fixture shall be able to be operated to a maximum power input voltage of 120V.
5. The PC fixture shall be able to use up to a 1000W lamp.
6. The PC fixture shall be supplied with a P28 lamp socket.
7. The PC fixture shall be supplied with a 4-foot long temperature resistant silicon rubber cable. There shall be three conductors of a 1.5mm diameter within. The power supply cable point of entry to the PC fixture shall be a trumpet gland constructed from high temperature resistant engineering plastic. There shall be no direct clamping pressure on the cable, and a separate IEC plug and connector shall not be acceptable. The power supply cable shall be retained by two separate indirect pressure points located within the cable connector compartment.
8. The PC fixture shall not exceed 18 lbs in weight including the barndoor accessory and color frame.
9. The PC fixture shall have the following dimensions:
 - a. Height: 15 15/16 inches.
 - b. Width: 11 7/16 inches.
 - c. Length: 18 7/8 inches.

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10. The lamp house of the PC fixture shall have rounded corners and edges with no sharp edges. It shall be constructed from aluminum and engineering plastics.
11. The sides of the PC fixture shall be constructed from extruded aluminum for strength, lower weight and no noise during the expansion and contraction period when the PC fixture is heating up. Sides constructed from sheet metal shall not be accepted. Ventilation of the PC fixture shall be maximized by not less than five convection slots running the entire length of the lamp house.
12. The front and rear of the PC fixture shall be constructed from high temperature and impact resistant engineering plastic moldings for strength, lower weight and no noise during the expansion and contraction period when the PC fixture is heating up. Front and rear castings constructed of metal shall not be accepted.
13. There shall be a rear grab handle mounted on the rear of the PC fixture. The grab handle shall be constructed from high heat and impact resistant engineering plastic and shall have a warning label formed as an integral part of the handle.
14. There shall be a cable connector compartment located on the outside back molding of the PC fixture. The power supply cable shall be terminated in this compartment and not in the main body of the fixture.
15. For ease of service, it shall be possible to gain access to the interior of the cable connector compartment by the removal of three screws and the cable connector compartment cover.
16. The paint finish of the PC fixture shall be low reflective, matt charcoal color, electrostatically applied, baked on epoxy powder coat. The finish of all exterior plastic components shall be matt charcoal color.
17. The PC lens shall be 6 inch diameter with a light diffusion rear surface; mounted inside the fixture and fully supported around its entire circumference. Stainless steel springs shall hold the lens in position and allow for movement caused by heat expansion.
18. The PC fixture shall have a spherical reflector, manufactured from 99.99% super pure aluminum anodized and polished to provide a pure specular reflector.
19. The lens and reflector shall be quickly accessed for cleaning without tools in the lamp housing by means of a side hinged bottom tray held closed with a spring clip assembly. It shall possible to clean the lens and reflector of the PC fixture without altering the set focus position.
20. The PC fixture shall comply with the following performance specifications when using a BTR 1000W 120V 27,500 lumens lamp:
 - a. Beam Angle: (2:1 variation from centre peak) 5-60 degrees.
 - b. Minimum Light Output: 5 degrees 306,600 Candela, 60 degrees 15,840 Candela.

B. Operation.

1. The PC fixture shall be panned by loosening the yoke nut and bolt, twisting the yoke to the desired position, and tightening the yoke nut and bolt.
2. The PC fixture shall incorporate a locking clamp disc and knob for tilt operation. The operator shall be able to loosen the tilt-locking knob, tilt the PC fixture and then lock the PC fixture in place.

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3. The focus fastening system shall be by a simple heat resistant low maintenance screw knob. A focus reference scale to record the focus position is to be provided.
4. The PC fixture shall have reference scales on the axis of movement to comply with stage lighting visualization software packages. The reference scales shall be marked with degrees marked in increments from the centre line of the fixture. Focus reference scale with the beam angle degree marked in increments from 7 to 50 degrees.
5. It shall be possible to access the lamp of the PC fixture without the need of tools and without altering the focus position of the fixture or the barndoor accessory. Lamp access that alters the focus position of the fixture or the barndoor accessory shall not be accepted.
6. The lamp access shall be by means of a side hinged bottom tray held closed with a spring clip assembly. The hinge design shall be incorporated in the shape of the lamp house side extrusion, and shall run the length on the lamp house for strength and rigidity.
7. The mains power shall be automatically disconnected when the lamp access tray is opened.
8. The PC fixture shall incorporate an integral safety cable that shall be able to be retracted into the fixture when not in use. The safety cable shall be rated for the weight of the fixture.
9. It shall be possible to adjust the balance of the PC fixture by repositioning the yoke as required along the length of the fixture. There shall be a balance point marked on the focus reference scale.
10. The PC fixture shall have three accessory slots for positioning of a safety mesh, color frame and barndoor accessory. The accessories shall be retained in the PC fixture with an accessory slot cover. A spring retention clip shall not be accepted.

2.32 STRAND SELECON HUI CYC SPECIFICATION.

A. Overview.

1. The Hui Cyc shall be a purpose-designed fixture designed for interior use for stage, studio and display lighting applications. It shall be constructed from custom aluminum extrusions, and sheet metal. The finish is to be a high temperature epoxy powder coated black.
2. The housing of the Cyc fixture shall be of sheet metal, joined by threaded screws to extruded aluminum extrusion, combining strength and rigidity with minimum weight.
3. The Cyc fixture shall be able to be used from a minimum distance of 3 feet from the base of the rear stage wall or cyclorama.
4. Each Cyc fixture shall have a safety glass to offer the highest level of protection from broken filament lamps. Each unit shall have a dual chamber system to maximize filter life.
5. The Cyc fixture shall have two accessory slots to accommodate a color frame and a barndoor accessory at the same time if required. Each accessory slot shall have a circular ventilation shaft to ensure smooth airflow over the sides of the color frame.

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6. There shall be an accessory slot cover constructed from extruded aluminum. The accessory slot cover shall run the width of the Cyc fixture to mask any unwanted spill. The accessory slot cover shall be hinged and can be left in the open or closed position to facilitate the changing of accessories.
7. Cyc fixtures that use a sprung steel type accessory retention clip shall not be accepted.
8. The color frame shall be constructed from sheet metal, and painted a matt black. It shall be a single piece hinged design and the internal edges shall be folded outwards to ensure there is no contact between the edge and the color filter.
9. There shall be three feet on the sides of the color frame folded outwards to ensure that the color filter is securely gripped when placed into the accessory slot of the Cyc fixture.
10. The Cyc fixture shall have an integral safety chain anchor point on each side of the fixture body.
11. The beam shall be very smooth and shall fall off evenly without visible highlights or shadows.
12. The Cyc fixture shall have an asymmetrical reflector of extruded textured aluminum, ensuring a high degree of uniformity between fixtures. Tabbed sheet metal is not acceptable.
13. The Cyc fixture shall be designed for use with:
 - a. 300W EHM, EHZ.
 - b. 500W FCL, FDN.
 - c. 750W EJG, EMD.
 - d. 1000W FCM, FHM.
14. The internal access shall be through the front of each unit, via the hinged color cassette and safety glass. A double microswitch cutout shall be used to fully electrically isolate the lampholders when the safety glass is opened.
15. Relamping shall be possible without having to change the focus position of the Cyc Fixture.
16. The Cyc fixture shall be ETL / cETL listed to UL 1573.
17. The Cyc fixture shall have a steel yoke for top suspension. A friction disc and heat insulated hand knob shall be mounted on the end section for tilt lock. Multiple cell configurations shall have an additional friction disc and heat insulated hand knob mounted on the opposite end section.
18. The Cyc fixture shall be supplied with an M12 suspension bolt, two washers and nut for attachment to an approved clamp for suspension.
19. It shall be possible to modify the Cyc fixture for ground row operation. This shall be by the addition of two screw jack feet constructed from rubber to dampen vibration, and reversing the color cassette.
20. It shall be possible to construct multiple battens from single units of the Cyc fixture. This shall be by bolting single units together using the Slot Lock Joiner Set. The Cyc fixture shall also be available in three and four way multiple cell configurations.

2.33 HOIST RIGGING SYSTEMS

A. General

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1. Hoist rigging systems shall consist of stage hoists and batten hoists for operating the front of house lighting and stage lighting equipment respectively, as well as lowering and raising lighting and scenery for production and maintenance purposes.

B. Batten Hoists

1. The De Sisti Rigging and Automation Batten Hoist shall be made of four elements.
 - a. The Motor compartment shall be a completely self contained enclosure and house a motorized winch drive unit of monoblock design with dual cable lifting drums, limit and load sensing switches and terminals for both the motor feed and control terminals.
 - b. The second element includes a terminal box for the load circuits with one or two folding trays to carry the lighting circuits in a U.L. approved flat cable to the connector strips.
 - c. The diverter pulley section shall house a number of diverter pulleys and wire ropes to support the total load of the hoist equipment.
 - d. The fourth element shall be a combination of connector strips housing the outlets, circuit wiring and any accessory items such as DMX in/out, audio video outlets, three phase outlets and a 1.9" diameter schedule 40 pipe batten. The combination of connector strip and lighting batten shall form a truss for mounting lighting instruments and be sized to meet the job conditions from 10' – 40' as specified.
 - e. Product shall be UL approved as a complete system. Systems using assemblages of UL listed parts, but not UL listed as a device will not be considered. The entire device must comply with all the safety standards as set forth by the internationally recognized testing authorized VBG 70 and carry the UL label.

C. Motor

1. The motor assembly shall house a 1.8kw 208 volt, 60 Hz 3-phase motor integrated with a self sustaining worm-gear set to prevent back winding in a static position and backed up by a braking system when the hoist is running.
2. Average lifting speed shall be 30' per minute. Safe working load shall be 520 lbs (Light Duty) and 1000 lbs (Heavy Duty).

D. Cable Management

1. Hoists shall include, when specified, an integrated connector strip and cable management system. Non integrated systems, requiring additional devices for cable management and electrical distribution, will not be accepted.

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- E. Standards
 - 1. All Hoists shall comply with all the safety standards of three Internationally recognized testing authorities who publish safety standards specifically written for hoist safety. Those authorities shall include TUV, the German Safety Standard, the DIN #15560 standard, part 46, safety standards (Worldwide safety standard form suspension systems mounted above and assembly of people.
 - 2. The product is to be TUF certified and U.L. Approved and carry the U.L. label tested and approval as a complete system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. It shall be the responsibility of the Electrical Contractor to receive and store the necessary materials and equipment for installation of the dimmer system. It is the intent of these specifications and plans to include everything required for proper and complete installation and operation of the dimming system, even though every item may not be specifically mentioned. The contractor shall deliver on a timely basis to other trades any equipment that must be installed during construction.
- B. The electrical contractor shall be responsible for field measurements and coordinating physical size of all equipment with the architectural requirements of the spaces into which they are to be installed.
- C. The electrical contractor shall install all lighting control and dimming equipment in accordance with manufacturer's approved shop drawings.
- D. All branch load circuits shall be live tested before connecting the loads to the dimmer system load terminals.

3.2 MANUFACTURER'S SERVICES

- A. Upon completion of the Lighting Control System installation, the system shall be completely examined by a Strand Lighting factory authorized or trained field service technician.
- B. This Commissioning/Start Up shall be performed within 2 to 4 weeks of written notification to Strand Lighting that all load and control wires have been installed and tested, and all elements of the project are prepared and ready in accordance with supplied installation instruction.
- C. The purchaser shall be liable for any return visits by the factory technician as a result of incomplete or incorrect installation.
- D. Upon completion of the Commissioning/Start Up, the technician shall demonstrate the operation and maintenance of the system to the owner's representatives.

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- E. Training, unless specifically written and outlined otherwise on the purchase order, shall not exceed four (4) hours.

3.3 WARRANTY

- A. Manufacturer shall warrant products under normal use and service to be free from defects in materials and workmanship for a period of two years from date of delivery.
- B. Warranty shall cover repair or replacement of such parts determined defective upon inspection.
- C. Warranty does not cover any product or part of a product subject to accident, negligence, alteration, abuse or misuse. Warranty does not cover any accessories or parts not supplied by the manufacturer.
- D. Warranty shall not cover any labor expended or materials used to repair any equipment without manufacturer's prior written authorization.

END OF SECTION 16570



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #13 – Revised Specification Section 12350
Laboratory Casework

9/17/12

SECTION 12350 - LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. General: Provide laboratory casework in accordance with requirements of the Contract Documents. The Work of this Section includes, but is not limited to the following:
1. Laboratory casework.
 2. Table frames.
 3. Work surfaces.
 4. Sinks, drain outlets.
 5. Service fittings.
 6. Fume hoods and bases.
 7. Accessory equipment.
- B. Related Work Specified Elsewhere
1. Architectural woodwork is specified under Section 06400 "Architectural Woodwork".
 2. Wood furring, blocking, shims, and hanging strips required for installation of laboratory casework and concealed within other construction before woodwork installation is specified under Section 06150 "Rough Carpentry".
 3. Electric and telecommunications wiring, connection to electric power source and building telecommunications lines, provision of outlets is specified under various sections in Division 16.

1.2 DEFINITIONS

- A. Definition of laboratory casework components by surface visibility are as follows: : Reference to the following locations shall be made when describing surface materials and finishes:
1. Exposed Surfaces
 - a. Surfaces visible when drawers and solid doors are closed.
 - b. Surfaces visible behind clear glass doors.
 - c. Interior surfaces of open units.
 - d. Bottoms of cabinets 42 in. or more above finished floor.
 - e. Tops of cabinets less than 72 in. above finished floor.

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- f. Front rails.
- 2. Semi-exposed surfaces
 - a. Surfaces which become visible when solid doors are open.
 - b. Bottoms of cabinets more than 30 in. but less than 42 in. above floor.
 - c. Tops of cabinets 72 in. or more above finished floor when visible from an upper level.
- 3. Concealed Surfaces
 - a. Surfaces not normally visible after installation, with doors open.
 - b. Bottoms of cabinets less than 30 in. above finished floor.

1.3 REFERENCES

- A. General: Comply with the applicable provisions and recommendations of references, except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the references, such recommendation or suggestion shall be considered mandatory. In the event of conflict between references, this specification or within themselves, the more stringent standard or requirement shall govern.
 - 1. Section 06400 "Architectural Woodwork".
 - 2. Architectural Woodwork Institute (AWI): "Architectural Woodwork Quality Standards".
 - 3. American Wood Preservers' Association (AWPA)
 - a. AWPA C9 "Plywood-Preservative Treatment by Pressure Process".
 - b. AWPA C20: "Structural Lumber—Fire-Retardant Treatment by Pressure Process".
 - c. AWPA C27 "Plywood-Fire Retardant Treatment by Pressure Process".
 - d. AWPA M4 "Care of Preservative-Treated Wood Products".
 - 4. National Electrical Manufacturer's Association (NEMA): NEMA LD3, "High Pressure Decorative Laminates
 - 5. Forest Stewardship Council (FSC): "FSC-STD-01-001 "Principles and Criteria for Forest Stewardship"

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6. The Scientific Equipment and Furniture Association "SEFA 1, "Laboratory Fume Hoods - Recommended Practices".
7. Consumer Product Safety Commission (CPSC): Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of CPSC 16 CFR Part 1201 for category II materials. Subject to compliance with requirements and local authorities having jurisdiction, provide safety glass with a removable certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
8. National Electric Code (NEC): NFPA 70: National Electrical Code.
9. United States Green Building Council (USGBC): Leadership in Energy & Environmental Design (LEED™): Green Building Rating System for New Construction & Major Renovations (NC) Version 2.2.

1.4 SYSTEM DESCRIPTION

- A. Green Building Performance Criteria: NJSDA has determined that this project may, in the future, be considered to be a LEED certified project and as such the following requirements shall be complied with as related to materials and systems specified herein.
 1. The manufacturing locations and origin of raw materials for the laboratory casework shall be identified and documented if within 500 miles of the project site.
 2. The post-industrial and/or post consumer recycled content (by weight) of the major metal components (at minimum stainless steel, aluminum and steel) shall be identified and documented.
 3. All field-applied adhesives, sealants, primers, paints and coatings used on the interior of the building shall meet the volatile organic compound (VOC) and chemical component limitations as defined in Section 01520 "Volatile Organic Compound Limits", VOC contents shall be identified and documented.
 4. Field Applied Sealants and Adhesives used on this Project shall comply with VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, and sealants used as fillers shall meet or exceed the requirements of Bay Area Air Quality Management District Regulation 8, Rule 51; as follows (expressed in grams of VOC per liter).
 5. All wood utilized in the laboratory casework work obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

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- B. Performance Requirements for Laboratory Casework
1. System Structural Performance: Laboratory casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
 - a. Support Framing System: 600 lb/ft.
 - b. Suspended Base Cabinets (Internal Load): 60 lb/ft..
 - c. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft.
 - d. Wall Cabinets (Upper Cabinets): 160 lb/ft.
 - e. Shelves: 40 lb/sq. ft.
 - f. Seismic Performance: Laboratory casework and support framing system, including attachments to other work, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 2. Fire Performance Characteristics of Wood Materials: Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with classification marking of inspecting and testing organization in the form of separable paper label or, where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.
 - a. Surface Burning Characteristics: Not exceeding values indicated below, tested per ASTM E84 for 30 minutes with no evidence of significant combustion.
- C. Performance Requirements for Fume Hoods
1. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 as modified below at a release rate of 4.0 L/min
 - a. Average Face Velocity: 100 fpm plus or minus 10% with sashes fully open.
 - b. Sash Position: Fully open.
 - 1) Test hoods with horizontal sashes with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
 - 2) Test hoods with combination sashes fully raised, with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
 - 3) As-Manufactured (AM) Rating: AM 0.05.

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- 4) Static-Pressure Loss: Not more than ½ in. wg at 100-fpm face velocity when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.
- 5) Structural Performance: Provide fume hood components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:
 - a) Fume Hood Base Stands: 50-lb/ft. work top, 75 lb/ft. on work top, plus weight of hood
 - b) Seismic Performance: Fume hoods, including attachments to other work, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

D. Performance Requirements for Laboratory Casework Fabricated with Wood Components

1. Standards: In addition to requirements shown and specified, comply with applicable provisions for grading and workmanship of AWI "Quality Standards".
 - a. Flame Spread: 25.
 - b. Smoke Developed: 50.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of product and process specified in this section and incorporated into items of Laboratory casework during fabrication, finishing, and installation. In addition, submit catalog cuts of hardware specified herein.
- B. Shop Drawings: Provide shop drawings of Laboratory casework for the fabrication and the installation of the Work. Include the following:
 1. Large scale details drawn at a minimum scale of 3 in. = 1 ft., dimensioned plans, locations and elevations, attachment devices, and adjacent work of other trades drawn at a minimum scale of 1/2 in. = 1 ft. Locate and specify each piece of cabinet hardware and related accessories.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified elsewhere.
 3. Show locations and sizes of cutouts and holes for items installed in laboratory casework.
 4. Show type and locations of laboratory casework hardware complete with templates required for installation.
 5. Show veneer leaves with dimensions, grain direction, exposed face, and an

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identification number indicated for each leaf. Identification number shall indicate the flitch and the sequence within the flitch for each leaf.

6. Fume Hoods
 - a. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.[Include calculations demonstrating that anchorages comply with seismic performance requirements.]
 - b. Indicate locations and types of service fittings together with associated service supply connection required.
 - c. Indicate duct connections, electrical connections, and locations of access panels.
 - d. Include roughing-in information for mechanical, plumbing, and electrical connections.
 - e. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
- C. Structural Calculations: Where installed laboratory casework and fume hood fabrications are required to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that have been signed and sealed by a qualified Professional Engineer registered in the State of New Jersey who was responsible for their preparation.
- D. Samples: Submit labeled samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit samples of each of the following items:
 1. Epoxy Resin Tops: 12 in. square, for each color, pattern and surface finish.
 2. Transparent finish for each species of wood veneer laminated to scheduled backers, 12 in. x 12 in. , for each finish specified or shown consisting of veneer pieces, laminated to panel product. Include at least one face-veneer seam and finish one-half of face as specified.
 3. Fume hood exterior finishes and interior lining: 12 in. square, for each color, pattern and surface finish.
 4. Laboratory casework cabinet hardware exposed in the finished work and other type hardware as requested.

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- E. Quality Control Submittals: Submit the following:
1. Test Reports
 - a. Performance Test Reports for Composite Wood Panels: Submit the following test reports showing compliance with required performance and testing criteria, from an independent testing laboratory:
 - 1) Flame spread and smoke developed ratings for each type of composite wood panel when tested when tested in accordance with ASTM E84, 'Unadhered Method', (fully exposed to burn chamber of testing equipment).
 2. Certifications
 - a. Certification of Fire Retardant Treatment of Wood: Submit certification, stating name of fire retardant materials used, and compliance with AWWA Specification C1 and C20 for lumber and C27 for plywood. Certify that fire retardant materials will not bleed through painted or natural finish surfaces.
 - b. Certification of Epoxy Surfaces: Submit certification, stating that the epoxy surface comply with these specifications.
 - c. Certification for Fume Hood: Submit certification, stating that the fume hoods comply with these specifications.
- F. Closeout Submittals: Submit the following:
1. Maintenance Manuals: Two (2) complete manuals describing the materials, and procedures to be followed in cleaning and maintaining the Work. Include manufacturers' brochures and lists describing actual materials used in the Work, including wood finishes, plastic laminate, metal alloys, finishes, cabinet hardware and other major components and accessories.

1.6 QUALITY ASSURANCE

- A. Qualified Installer: The Laboratory casework work shall be performed by a firm having 5 years experience in the installation of specified materials on comparable projects. The firm shall have the approval of the Laboratory casework materials manufacturer. The installer shall provide evidence of successful completion of work of similar scope to that shown and specified for this Project using similar Laboratory casework systems.
- B. Sole Source Responsibility: Obtain Laboratory casework from one source of a single manufacturer. Obtain accessory products used in conjunction with Laboratory casework from the Laboratory casework manufacturer or from sources acceptable to the Laboratory casework manufacturer. The manufacturer shall furnish evidence that the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project

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- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- D. Forest Certification: Provide laboratory casework produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
- E. Visual Mock-Ups
 - 1. Provide visual mock-ups of the following items consisting of all the specified components of sizes as shown:
 - a. Wood laboratory casework.
 - b. Table frames.
 - c. Work surfaces.
 - d. Fume hood and fume hood base.
 - 2. Locate the mock-ups where directed. Provide lighting of similar type and level as that of final installation for viewing. Demonstrate the proposed range of aesthetic effects and workmanship. Alter or revise mock-ups, as directed, to obtain the acceptance of the Owner.
 - 3. The accepted mock-ups shall serve as a standard of quality for specified item(s) for the project and may remain as a permanent part of the Work if in same condition as new at time of final acceptance. The approval of the mock-ups does not relieve the Contractor of its obligation to perform the work in accordance with the Contract Documents.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Protect Laboratory casework during transit, delivery, storage and handling to prevent damage. Cover and keep covered with non-staining protective wrapping.
- B. Storage and Protection: Store Laboratory casework in a dry, well ventilated space, matching the environmental conditions of the finished installation.

1.8 PROJECT/SITE CONDITIONS

- A. Requirements:
 - 1. Conditioning of Laboratory casework: Condition laboratory casework to average prevailing humidity conditions in installation areas before installing.

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2. Maintain temperature and humidity levels in installation areas as required so as not to cause damage to installed items.
- B. Existing Conditions
1. Conditions Prior to Installation of Laboratory casework: Do not install laboratory casework in any space until wet work in such space is dry to the satisfaction of the woodwork fabricator and installer, and only when the building's mechanical system can maintain the relative humidity and temperature at occupancy levels during the remainder of the construction period so that the woodwork will not be damaged by excessive changes. (Relative humidity and temperature at occupancy levels shall be agreed upon prior to installation of any Laboratory casework). Comply with AWI requirements as related to installation of Laboratory casework.

1.9 LABORATORY CASEWORK DESIGN

- A. Door and Drawer Design: Flush Overlay: Square edged flush overlay design with 1/8 in. reveal horizontal and vertical and 1/16 in. vertical reveal on ends of cabinets.
- B. Standard grain pattern on end panels is vertical.
- C. Grain pattern on cabinet fronts: Matched Vertical Grain: Vertical grain match on door and drawer fronts.
- D. Cabinet end panels exposed to view after installation must be specified as a "finished end" panel. All end panels not exposed to view after installation will be clad as listed under "unexposed" plywood.
- E. Self-supporting units capable of interchangeable use.
- F. Flush Interiors: Set cupboard bottom flush with front end facers. Surface mounted bottoms and offsets caused by front face frames which interfere with ease of cleaning are not acceptable.
- G. Joinery: 8mm x 30mm doveled system or mortise and tenon joinery glued, clamped and screwed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. General: Provide laboratory casework as produced by one manufacturer for the entire project. Products **as scheduled at the end of this section and as** specified herein are the design standard, as manufactured by Kewaunee Scientific Corporation; Laboratory Products Group, and establish the quality standards required. Products of the following manufacturers will be acceptable:
 1. Air Master Systems Corporation.

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2. Leonard Peterson & Co, Inc.
3. Hall Casework Systems Inc.
4. Fisher Hamilton L.L.C.
5. Hanson Lab Furniture, Inc.
6. Jamestown Metal Products.
7. Labconco Corporation.
8. Lab Crafters, Inc.
9. Lab Fabricators.
10. Laboratory Design & Supply.
11. Laboratory Equipment Manufacturers.
12. Or approved equal.

2.2 MATERIALS

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/; matte finish; suitable for exposed applications.
- B. Stainless-Steel Sheet: ASTM A240 or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- C. Glass: 5/16 in. thick laminated safety glass without imperfections or marred surfaces. Permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction Comply with requirements of Section 08800 "Glazing" including for safety glazing.
- D. Epoxy Work Surfaces: Factory molded, modified epoxy-resin formulation with smooth, non-specular finish.
 1. Physical Properties:
 - a. Flexural Strength: Not less than 10,000 psi.
 - b. Modulus of Elasticity: Not less than 2,000,000 psi.
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02%.
 - e. Heat Distortion Point: Not less than 260 deg F.

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- f. Flame-Spread Index: 25 or less per ASTM E 84.
 2. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
 - a. No Effect: Acetic acid (98%), acetone, ammonium hydroxide (28%), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70%), phenol, sulfuric acid (60%), and toluene.
 - b. Slight Effect: Chromic acid (60%) and sodium hydroxide (50%).
 3. Color: As selected from manufacturer's full range of standard colors
 4. Subject to compliance with requirements, provide products by one of the following:
 - a. Epoxyn Products.
 - b. Durcon Company.
 - c. Laboratory Tops, Inc.
 - d. Prime Industries, inc.
 - e. or approved equal.
- E. Adhesives: Moisture resistant complying with FS MMM-A125, Type II, or MMM-A-188, Type I, II or III; type best suited for the purpose unless otherwise specified.

2.3 LABORATORY CASEWORK MATERIALS

- A. Hardwood: Hardwood lumber, clean and free of defects. All lumber kiln dried to uniform moisture content of six percent.
 1. Exposed material: Red Oak .
 2. Semi-exposed material: Select Hardwood.
 3. Unexposed material: Sound Hardwood of species suitable for the intended purpose.
- B. Cabinet Core Construction:
 1. 7-ply and 9-ply Veneer Core Plywood: All laboratory casework ends, tops, bottoms, shelves.
 2. 3-ply Particle Board Plywood: Cabinet Sides and Base Cabinet Bottoms (Shelves, wall case tops and bottoms, and tall case tops are always veneer core plywood.).
 - a. Exposed plywood face select grade: Rift sliced red oak veneer.

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- b. Semi-exposed: Plywood including a face of select hardwood veneer.
- c. Unexposed: Plywood including a face of sound grade hardwood veneer.
- C. Welded fiberboard: Wood fibers and resin binders formed under heat and pressure.
- D. Finish: Highly chemical resistant modified acrylic urethane with built in U.V. blocker or equal finish applied over stain of selected color.

2.4 LABORATORY CASEWORK FABRICATION

- A. Base Units:
 - 1. Cabinet Ends: 3/4 in. thick plywood with 3mm hardwood banding on front edges. Bore interior faces, as appropriate, for security panels, rails, and four rows of shelf support holes. Provide four metal corner gusset levelers with threaded adjustment screws and floor pad on all base cabinets
 - 2. Front Top Rail: 1 in. x 3 in. solid hardwood. Attach to cabinet ends with glued 8mm dowel joinery and screws.
 - 3. Vertical Back Top Rail: 3/4 in. x 3-3/4 in. hardwood or 7-ply plywood. Attach to cabinet ends with glued 8mm dowel joinery and screws.
 - 4. Provide top side rails: 1-1/2 in. x 3/4 in. hardwood between front horizontal and back vertical rail glued and screwed in place.
 - 5. Front: hardwood or 7-ply veneer core plywood 3-3/4 in. x 3/4 in. toe space rail, mounted between end panels, forming a 4 in. high x 2-1/2 in. deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels with 8mm dowel joinery glued in place.
 - 6. Base Unit Bottoms: 3/4 in. thick 7-ply veneer core plywood, set flush and joined to cabinet end panels with 8mm dowels on 96mm dowel spacing joinery glued with metal fasteners. Front edge to be banded with 3mm hardwood banding.
 - 7. Cupboard Unit Backs: shall be removable one piece 3/16 in. hardboard supplied on cupboard units. Provide removable 3/16 in. hardboard split back panels behind drawer units
 - 8. Vertical Dividers: Full height dividers shall be 1-1/2 in. thick plywood glued and screwed in place, top and bottom. Provide 3mm banding on front edge.
 - 9. Base Unit Intermediate Rails:
 - a. Front Horizontal Intermediate Rail: 3/4 in. x 1-1/2 in. exposed hardwood rail to be provided between door and drawers. Secure to cabinet end panels with 8mm dowel joinery.

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- b. Intermediate Rear Rail: 3/4 in. x 1-1/2 in. exposed hardwood rail to be provided. Secure to cabinet end panels with 8mm dowel joinery.
 - 10. Security Panel: Provide hardboard security panels between drawers and above doors on units with locks. (Select for all cabinets with locks keyed differently.)
 - 11. Shelves for base units: All shelves constructed of 7 or 9-ply veneer core plywood. Provide 3mm hardwood banding on front edge of all shelves. Base unit shelves are to be adjustable on 32mm centers.
 - a. 3/4 in. thick - 65 lb. rating (12 in., 15 in., 18 in., 21 in., and 24 in. widths)
 - b. 1 in. thick - 100 lb. rating (36 in., 42 in., and 48 in. widths)
 - 12. Drawer Construction: Four-sided drawer box back, front and sides to be of 12mm (1/2 in. nominal) 9-ply Birch plywood, finished with acrylic urethane finish. Drawer joinery shall be chuck and bore (dowel) construction on 32mm centers or multiple dovetail at --- mm centers. Three-sided drawer box blind dovetailed to outer drawer front will not be accepted.
 - 13. Drawer Bottom: Drawer bottom shall be 6mm white PVC clad board. Bottom shall be grooved into the 4 sided drawer box and sealed with hot melt glue process around entire drawer bottom perimeter.
 - 14. Drawer Suspension: mechanical slides
 - a. Full extension 100# dynamic load, epoxy coated Accuride 3832 series or approved equal on all drawers except file drawers.
 - b. Provide full extension slide with overtravel, 150# static and dynamic load, zinc plated (Accuride 4034 series or approved equal) on all file drawers.
 - 15. Door and Drawer Front Construction 3/4 in. door and drawer fronts shall be 3-ply, solid core surfaced with veneer on both sides and edge banded on all four sides with 3mm hardwood banding.
- B. Wall, Upper and Tall Cases:
- 1. Shall be manufactured with appropriate materials and joinery methods as specified for base units.
 - 2. Wall, Upper and Tall Case Tops: 1 in. thick, 9-ply veneer core plywood with 3mm banding on front edge.
 - 3. Wall and Upper Case Bottoms: 1 in. thick, 9-ply veneer core plywood with veneer on both sides and with a 3mm banding on the front edge.
 - 4. Tall Case Bottoms: 3/4 in. thick 7-ply veneer core plywood with veneer on both sides and with a 3mm banding on the front edge.

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5. Bottom kick rail: Veneered plywood rail on tall cases 3-3/4 in. high joined to cabinet sides with 8mm dowels glued.
 6. Backs: 1/4 in. thick veneered hardboard with backs recessed 7/8 in. and set into top, bottom and ends and sealed with hot melt glue process around entire perimeter. Recessed horizontal support rails as required.
 7. Shelves:
 - a. 3/4 in. thick - 65 lb. rating (12 in., 15 in., 18 in., 21 in., 24 in. and 30 in. widths)
 - b. 1 in. thick - 100 lb. rating (36 in , 42 in., and 48 in. widths)
 8. Door construction: Solid Doors: 3-ply, 3/4 in. thick solid core construction with veneer on both sides and with 3mm hardwood banding on four edges. [Standard Default]
 9. Framed-glazed Doors: Solid hardwood construction, 3/4 in. x 2-3/4 in. frame stock machined to accept glass. Provide extruded vinyl retaining molding designed so glass can be replaceable without tools. Meeting edges of pairs of doors to include overlapping astragals: right over left.
 10. Unframed Sliding Glass Doors: glass with edges ground, set in extruded aluminum shoe with integral pulls, nylon wheel assemblies, and top anodized extruded aluminum track. Provide rubber bumpers at fully opened and closed door position.
- C. Hardware:
1. Drawer and Hinged Door Pulls. (Full length pulls shall be mounted horizontally on drawers and base cabinet doors and vertically on wall, upper and tall case doors. All other pulls are mounted horizontally on drawers and vertically on doors) Provide stainless steel wire finger pulls.
 2. Hinges: Provide two hinges for doors up to 48 in. high; three hinges for doors over 48 in. high. Provide stainless steel - 5-knuckle.
 3. Unit Shelf Supports: Metal pin and socket.
 4. Door Catches: Adjustable type, spring actuated nylon roller catches.
 5. Elbow Catches: Spring type with strike.
 6. Locks, Where Indicated on Drawings: Lock types feature heavy duty cylinder. Exposed lock nose finish to be dull nickel (satin) plated.
 - a. 5-disc tumbler for MASTER key system.

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- b. Keys: Stamped brass available from manufacturer or local locksmith, and supplied in the quantities as required by Owner.
- 7. Base Molding: Selected material and color to be furnished and installed by flooring contractor under his specification section.
- 8. Label Holders: (if shown on drawings) Shall be steel finished 1 in. x 2-1/2 in. pinned to drawer and door fronts. Provide one on each single or double door and one on each drawer
- 9. Number plates: (if shown on drawings) Shall be anodized aluminum with black numbers. Start with number (1) in each room where required.

2.5 BENCH TOP FABRICATION

- A. Tops and Splashbacks: Fabricate bench, service strip, table and hood working tops of materials specified and/or shown and of lengths as long as practicable. Securely fasten tops to cabinet rails and tables with heavy metal fastening devices or with ample screws through pierced slots in cabinet rails. Provide tops adjoining walls with 4 in. high splashback, 3/4 in. or 1-3 in. thick as required, unless otherwise shown or specified.
- B. Epoxy Resin: Fabricate top of a minimum of 1 in. thick, molded from a modified epoxy resin especially compounded and cured to give physical and chemical resistance required of heavy duty laboratory tops. Provide tops and curbs with a uniform mixture throughout their full thickness and do not depend upon a surface coating that is readily removed by chemical and/or physical abuse. Provide black tops with integral molded, 4 in. high, 3/4 in. thick and 5/8 in. radius coved splashbacks, drip grooves on underside and exposed edges chamfered. Spline all joints and seal together as recommended by the manufacturer.

2.6 TABLE FRAME FABRICATION

- A. Perimeter Table Frame Rails: 3/4 in. x 4-5/16 in. hardwood with attached steel corner braces, grooved and screwed into both rails at each corner. (Final finish on bottom rail - radiused.) Reinforcing Cross Rails: 7-ply plywood doweled and glued into front and back rails and pinned at intervals not more than 33 in. o.c. in tables without drawers.
- B. Separate Cross Rails: 3/4 in. x 4-5/16 in. hardwood with attached steel brackets at both ends.
- C. Legs: 2 in. x 2 in. hardwood.
- D. Leg Shoes: Black rubber or vinyl with provision for floor clip.

2.7 FUME HOOD FABRICATION

- A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35 in. x-79 in. door opening.

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- B. Steel Exterior: Fabricate from steel sheet, not less than 0.0478 in. thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
- C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.
- D. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- E. Interior Lining: Provide one of the following unless otherwise indicated:
 - 1. Glass-fiber cement board, not less than 1/4 in. thick, with white acid-resistant finish.
 - 2. Steel sheet, not less than 0.048 in. nominal thickness, with white epoxy coating.
 - 3. Glass-fiber-reinforced polyester, not less than 1/4 in. thick.
 - 4. Epoxy, not less than 1/4 in. thick.
 - 5. Glass-fiber-reinforced epoxy, not less than 1/4 in.
- F. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly. Fasten lining components together with stainless steel cleats or angles to form a rigid assembly to which exterior panels are attached.
- G. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom for airflow through hood. Secure baffle to cleats at rear of hood with stainless-steel screws. Fabricate baffle for easy removal for cleaning behind baffle. Provide preset baffles.
- H. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection. Duct-Stub Material: stainless steel. Provide constant-volume fume hoods without bypass
- I. Bypass Grilles: Provide grilles at bypass openings of bypass and restricted bypass fume hoods.
- J. Sashes: Provide operable sashes fabricate from 0.050 in. nominal thickness stainless steel. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets. Glaze with laminated safety glass.
 - 1. Counterbalance vertical-sliding sash with sash weight and stainless-steel cable system

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to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.

- K. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 1in. space between airfoil and work top. Sash closes on top of airfoil, leaving 1in. opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow. Fabricate airfoil from stainless steel.
- L. Light Fixtures: Provide vaporproof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with ¼ in. thick laminated glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.
- M. Fume Hood Base Stands: Fabricated from not less than 2 in. square, electrically welded steel tubing. Provide leg stretchers where necessary to comply with structural performance requirements. Weld leg stretchers, cross stretchers, and work top support rails to legs, and finish entire assembly with chemical-resistant finish. Provide leveling device at each corner of base stand at floor
- N. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, [finished with acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes

2.8 WOOD FINISH

- A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.
- B. Staining: Remove fibers and dust and apply stain to exposed and semi-exposed surfaces as necessary to match approved Samples. Apply stain in a manner that will produce a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.
- C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard three coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

PART 3 - EXECUTION

3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and erect the work of this Section, including equipment, components, and accessories in accordance with the manufacturer's instructions,

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except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer
- B. Deliver items which are to be built into the work of other sections in time so as not to delay the progress of the Work.

3.4 INSTALLATION

- A. Install the Work of this Section in accordance with manufacturer's written installation instructions, so that completed installation is in perfect operating condition.
- B. Laboratory Casework Installation: Comply with installation requirements in SEFA 2.3.
 - 1. Set laboratory casework components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims. Fasten continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16 in. tolerance.
 - 2. Secure wall cabinets to solid supporting material, not to gypsum board. Blocking in wall by rough carpentry. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8 in. between top units.
- C. Work Surface Installation: Comply with installation requirements in SEFA 2.3.
 - 1. Where required due to field conditions, scribe to abutting surfaces. Secure joints in the field, where practicable, in the same manner as in factory, with dowels, adhesive or fasteners recommended by manufacturer. Secure work surfaces to laboratory casework and equipment components with material and procedures recommended by the manufacturer.
 - 2. Fastening: Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 in. o.c. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 in. and plug hole

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flush with material equal to countertop in chemical resistance, hardness, and appearance.

- D. Sink Installation: Sinks shall be set in chemical resistant sealing compound and secured and supported per manufacturer's recommendations. Comply with requirements in Divisions 15 and 16 Sections for installing water and laboratory gas service fittings and electrical devices. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work top material. Securely anchor fittings to fume hoods unless otherwise indicated
- E. Fume Hood Installation: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

3.5 FIELD QUALITY CONTROL

- A. Field test installed fume hoods according to "Flow Visualization and Velocity Procedure" requirements in ASHRAE 110. Test one installed fume hood, selected by Owner, according to ASHRAE 110 as modified. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified. After making corrections, retest fume hoods that failed to perform as specified

3.6 ADJUSTING

- A. Repair or remove and replace defective work, as directed by Owner upon completion of installation.
- B. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly. Adjust moving parts of fume hoods for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

3.7 CLEANING

- A. Clean shop finished laboratory casework, touch up as required. Clean materials as recommended by manufacturer.

3.8 PROTECTION OF FINISHED WORK

- A. Provide necessary protective measures to prevent damage of laboratory casework and equipment from exposure to other construction activity.
- B. Advise contractor of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

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3.9 SCHEDULE OF LABORATORY CASEWORK

A. Basis of design: Kewaunee Scientific Corp.

B. Student Workstation (Island Counter)

Kewaunee model #T80W364995-3105X (3'-6"x5'-4") consisting of:

Sink:

(1) 1001-00 7" H x 8" W x 16" L I.D.

(1) 0482-00 1 1/2" I.P.S. Sink Outlet

Electric Fixtures:

(1) 0656-03 120 VAC GFI Duplex Pedestal

Fittings:

(2) W-0337-0V Cold Water w/VB Gooseneck

(2) W-0266-00 Double Outlet Service Fitting

(4) 0548-00 Rod Sockets

C. Teachers Work Station

Kewaunee model #T31W363096 - 96" Instructor's Demonstration Bench & #T35W313048 Instructor's Bench Desk with Keyboard Tray, consisting of:

#T31W363096

Sink:

(1) 1003-00 Kemresin Sink – 11" H x 15" W x 18" L I.D.

(1) 0482-BP 1 1/2" I.P.S. Sink Outlet

Electric Fixtures:

(1) 0656-01 120 VAC GFI Duplex Receptacle

Fittings:

(2) W-0337-0V Cold Water w/VB Gooseneck

(1) W-0263-00 Double Outlet Service Fitting

(2) 0548-00 Rod Sockets

(1) 4740-00 Upright Rod Assembly

#T35W313048

(1) D90W302218- 3-Drawer Cabinet w/Pull Board

(1) A80W002220-00_0 Frame with Keyboard Tray– 29" L

(1) G70W240647-00_0 Book Shelf 6" D x 26" H x 47" L

D. Swinging Panel Door Cabinets

Kewaunee model #W25 - 12" deep, lengths per drawings

E. Cupboard and Drawer Cabinets

Kewaunee model #E41 - lengths per drawings

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F. Acid Storage Cabinets

Kewaunee model #G21 - lengths per drawings

G. Wood Solvent Storage Base Cabinets (Flammable Storage)

Kewaunee model #G63 - lengths per drawings

H. Fume Hood and Sink Cabinets

Kewaunee model #H08K5460P00HM2 Fume Hood & #G21 Sink Cabinet, including:

- (1) W-0337-0V Cold Water w/VB Gooseneck**
- (1) W-0263-00 Double Outlet Service Fitting - Gas**
- (1) W-0263-00 Double Outlet Service Fitting - vacuum**

I. Stainless Steel Laboratory Pegboards

Kewaunee model #X-020004 with Drip Trough

J. Refrigerators

Kewaunee model #L-105

K. Dishwasher

**Labonco model #4578020 Undercounter SteamScrubber 33.
Provide with water purification system.**

L. Counter sink & base

Sink:

**Kewaunee model #1005-00-BK 10" H x 15" W x 25" L I.D.
0482-00 1 1/2" I.P.S. Sink Outlet
W-0340-0V Deck Mounted Hot and Cold Water Mixing Vacuum
Breaker Gooseneck Faucet**

Base:

Kewaunee model #G07 - lengths per drawings

M. Locks

5-pin locks at all cabinets and drawers. No lock panels

N. ADA Safety Cabinet

Kewaunee model #G85

SECTION 12350 - LABORATORY CASEWORK

END OF SECTION 12350



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #14 – Revised Drawing P-101A
Plumbing Ground Floor Plan
Part A

9/17/12

SDA

NJ Schools Development Authority

ELIZABETH ACADEMIC HIGH SCHOOL

Owner
State of New Jersey Schools
Development Corporation
1 West State Street
Trenton, NJ 08625
(609) 943-5955

Project Management
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512 Morris Avenue, Suite 2B
Elizabeth, NJ 07208
(908) 354-3600

Architect
SOM
SKIDMORE, OWINGS & MERRILL PA
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(212) 298-9300

Structural Engineering
Consulting Engineers
Collaborative, Inc
730 Boulevard
Kamathurst, NJ 07033
(908) 298-1600

Mechanical & Electrical Engineering
Plumbing and Fire Protection
Concord Engineering Group, Inc.
520 South Burnt Mill Road
Voorhees, NJ 08043
(856) 427-0200

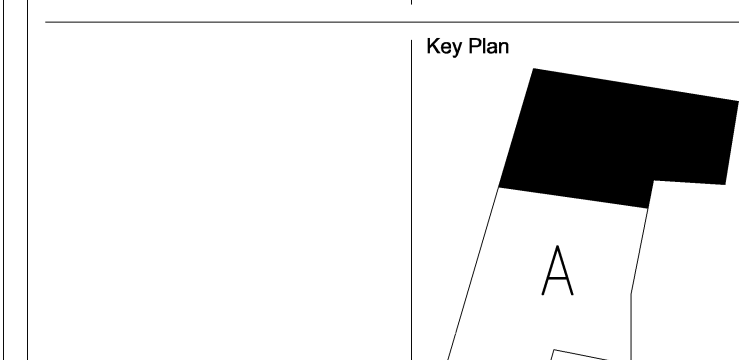
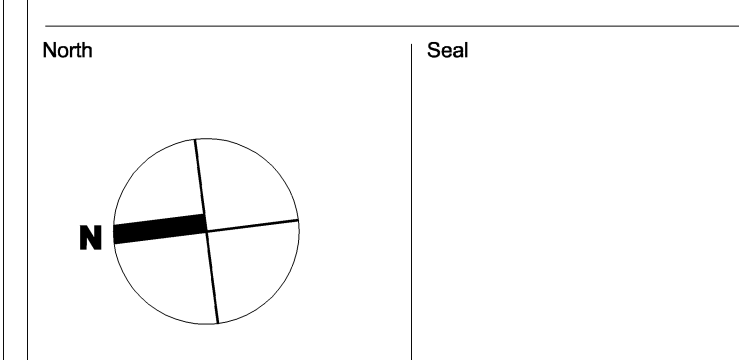
Surveying and Civil Engineering
Langan Engineering
Riverside Center 1
Elmwood Park, NJ 07407
(201) 794-6900

Landscape Design
MKW & Associates
39 Park Avenue
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(301) 320-8200

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Code Consultants, Inc.
330 West 38th Street
New York, NY 10018
(212) 218-8888



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District Board President Signature
FRANCISCO GONZALEZ

Date: 09/17/2012

Issued For: ADDENDUM 5

Date: JULY 13, 12

Issued For: BID

No. _____ Date _____ Issue _____

Sheet Name _____

- PLUMBING NOTES:**
- SEE 6-005 FOR PLUMBING FIXTURE MOUNTING HEIGHTS.
 - REFER TO A-101A THROUGH A-104B FOR PLAN DIMENSIONS FOR PLUMBING FIXTURES.

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File Name: _____

P-101A





Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #15 – Revised Drawing P-101B
Plumbing Ground Floor Plan
Part B

9/17/12

SDA
NJ Schools Development Authority
ELIZABETH
ACADEMIC HIGH
SCHOOL

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Development Corporation
1 West State Street
Trenton, NJ 08625
(609) 943-6955

Project Management
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Structural Engineering
Consulting Engineers
Collaborative, Inc.
730 Boulevard
Kensington, NJ 07033
(908) 298-1600

Mechanical & Electrical Engineering
Plumbing and Fire Protection
Concord Engineering Group, Inc.
520 South Burnt Mill Road
Voorhees, NJ 08043
(856) 427-0200

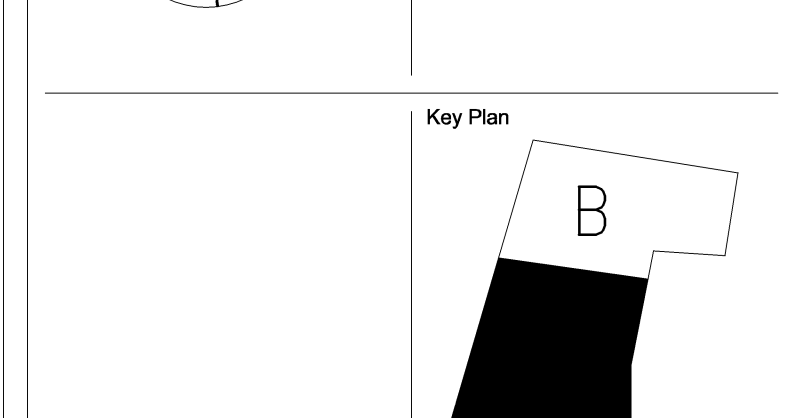
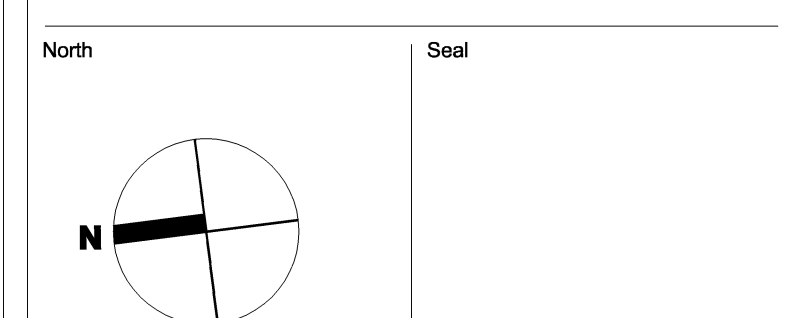
Surveying and Civil Engineering
Langan Engineering
River Drive Center 1
Elmwood Park, NJ 07407
(201) 794-6900

Landscape Design
MKW & Associates
39 Park Avenue
Rutherford, NJ 07070
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PLUMBING
GROUND FLOOR
PLAN - PART B

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File Name:

P-101B



- PLUMBING NOTES:**
- SEE 9-005 FOR PLUMBING FIXTURE MOUNTING HEIGHTS.
 - REFER TO A-101A THROUGH A-104B FOR PLAN DIMENSIONS FOR PLUMBING FIXTURES.



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #16 – Revised Drawing P-102A
Plumbing Second Floor Plan
Part A

9/17/12

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ELIZABETH ACADEMIC HIGH SCHOOL

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Langan Engineering
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Specialists, Inc.
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New York, NY 10010
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Fire Protection and Life Safety
Code Consultants, Inc.
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New York, NY 10018
(212) 218-8888

North Seal

Key Plan

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District Board President Signature
FRANCISCO MONZALIZ

| No. | Date | Issue |
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| 1 | 09/17/2012 | ISSUED FOR ADDENDUM 5 |
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Sheet Name: PLUMBING SECOND FLOOR PLAN - PART A

PLUMBING
SECOND FLOOR
PLAN - PART A

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SOM Job No: 209055

File Name: P-102A



SHEET NOTES:

1. GAS, HOT AND COLD WATER LINES SERVES SCIENCE LABORATORY ISLAND TABLES AND EQUIPMENT ABOVE. EXTEND LINES THROUGH "LOWEY" CONTROL BOX PRIOR TO SCIENCE LAB EQUIPMENT.

PLUMBING NOTES:

1. SEE 6-005 FOR PLUMBING FIXTURE MOUNTING HEIGHTS.

2. REFER TO A-101A THROUGH A-104B FOR PLAN DIMENSIONS FOR PLUMBING FIXTURES.



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #17 – Revised Drawing P-102B
Plumbing Second Floor Plan
Part B

9/17/12

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SCHOOL

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Landscape Design
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Specialists, Inc.
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New York, NY 10010
(301) 320-8200

Fire Protection and Life Safety
Code Consultants, Inc.
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New York, NY 10018
(212) 218-8888



SHEET NOTES:
① GAS, HOT AND COLD WATER LINES SERVES SCIENCE LABORATORY ISLAND TABLES AND EQUIPMENT ABOVE. EXTEND LINES THROUGH "SHIELD" CONTROL BOX PRIOR TO SCIENCE LAB EQUIPMENT.

PLUMBING NOTES:
1. SEE 6-026 FOR PLUMBING FIXTURE MOUNTING HEIGHTS.
2. REFER TO A-101A THROUGH A-104B FOR PLAN DIMENSIONS FOR PLUMBING FIXTURES.

North

Key Plan

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District Board President Signature
FRANCISCO MORALES

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PLUMBING
SECOND FLOOR
PLAN - PART B

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File Name: _____

P-102B



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #18 – Revised Drawing P-103A
Plumbing Third Floor Plan
Part A

9/17/12



SHEET NOTES:
 ① GAS, HOT AND COLD WATER LINES SERVES SCIENCE LABORATORY ISLAND TABLES AND EQUIPMENT ABOVE. EXTEND LINES THROUGH "ISLAND" CONTROL BOX PRIOR TO SCIENCE LAB EQUIPMENT.

PLUMBING NOTES:
 1. SEE 6-005 FOR PLUMBING FIXTURE MOUNTING HEIGHTS.
 2. REFER TO A-101A THROUGH A-104B FOR PLAN DIMENSIONS FOR PLUMBING FIXTURES.

SDA

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 520 South Burnt Mill Road
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 (856) 427-0200

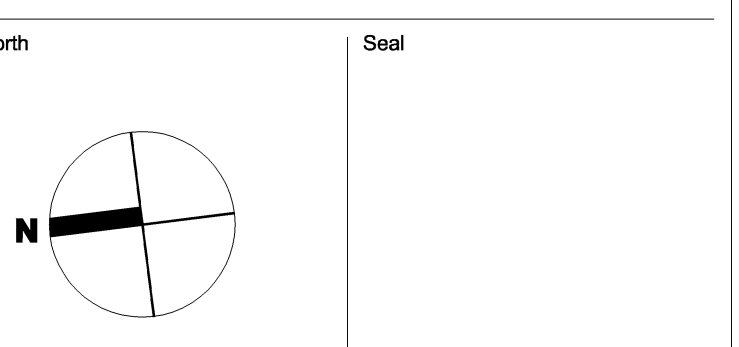
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Langan Engineering
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Landscape Design
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 Specialists, Inc.**
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 New York, NY 10010
 (301) 320-6200

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 New York, NY 10018
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Sheet Name

**PLUMBING
 THIRD FLOOR
 PLAN - PART A**

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 SOM Job No: 209065
 File Name: P-103A



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #19 – Revised Drawing P-103B
Plumbing Third Floor Plan
Part B

9/17/12

SDA
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ELIZABETH
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SCHOOL

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State of New Jersey Schools
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Elizabeth, NJ 07208
(908) 354-3600

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New York, NY 10005
(212) 298-9300

Structural Engineering
Consulting Engineers
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Kamrath, NJ 07033
(908) 298-1600

Mechanical & Electrical Engineering
Plumbing and Fire Protection
Concord Engineering Group, Inc.
520 South Burnt Mill Road
Voorhees, NJ 08043
(856) 427-0200

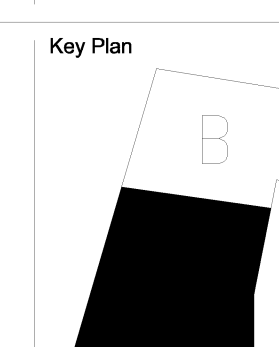
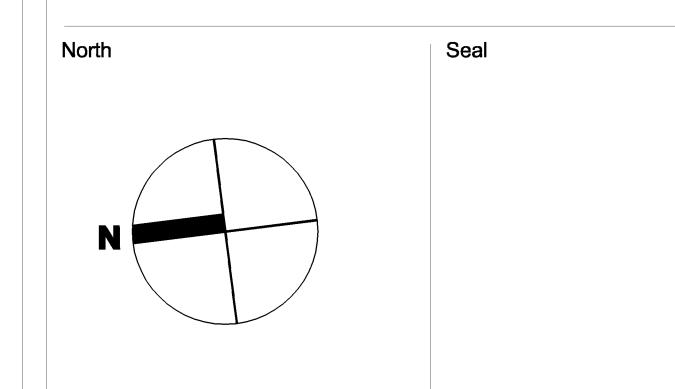
Surveying and Civil Engineering
Langan Engineering
River Drive Center 1
Elmwood Park, NJ 07407
(201) 794-6900

Landscape Design
MKW & Associates
39 Park Avenue
Rutherford, NJ 07070
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Information Technology
Intertech Associates, Inc.
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Suite A-14
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(212) 218-5566



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FRANCISCO KONZALIZ

District Board President Signature
FRANCISCO KONZALIZ

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| 9 | JUN 25, 12 | DCA AMENDED RELEASE |
| 8 | MAY 29, 12 | REISSUED FOR DCA REVIEW |
| 7 | JULY 13, 12 | ISSUED FOR BID |
| 2 | 09/17/2012 | ISSUED FOR ADDENDUM 5 |
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PLUMBING
THIRD FLOOR
PLAN - PART B

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Scale: 1/8" = 1'-0"
SOM Job No.: 209065
File name: _____

P-103B



PLUMBING NOTES:
1. SEE 6-025 FOR PLUMBING FIXTURE MOUNTING HEIGHTS.
2. REFER TO A-101A THROUGH A-104B FOR PLAN DIMENSIONS FOR PLUMBING FIXTURES.



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #20 – Revised Drawing P-205
Plumbing Storm Riser Diagram

9/17/12

SDA
NJ Schools Development Authority
ELIZABETH
ACADEMIC HIGH
SCHOOL

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(908) 298-1600

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520 South Burnt Mill Road
Voorhees, NJ 08043
(856) 427-0200

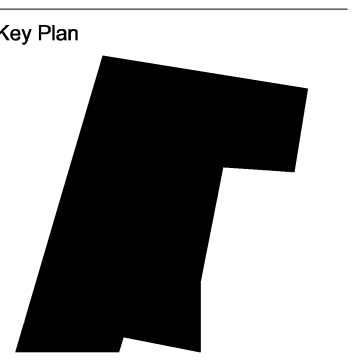
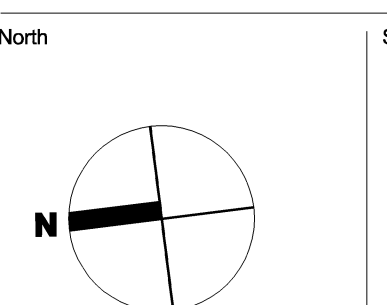
Surveying and Civil Engineering
Langan Engineering
River Drive Center 1
Elmwood Park, NJ 07407
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Landscape Design
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Rutherford, NJ 07070
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Specialists, Inc.
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Code Consultants, Inc.
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New York, NY 10018
(212) 218-5556



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FRANCISCO GONZALEZ

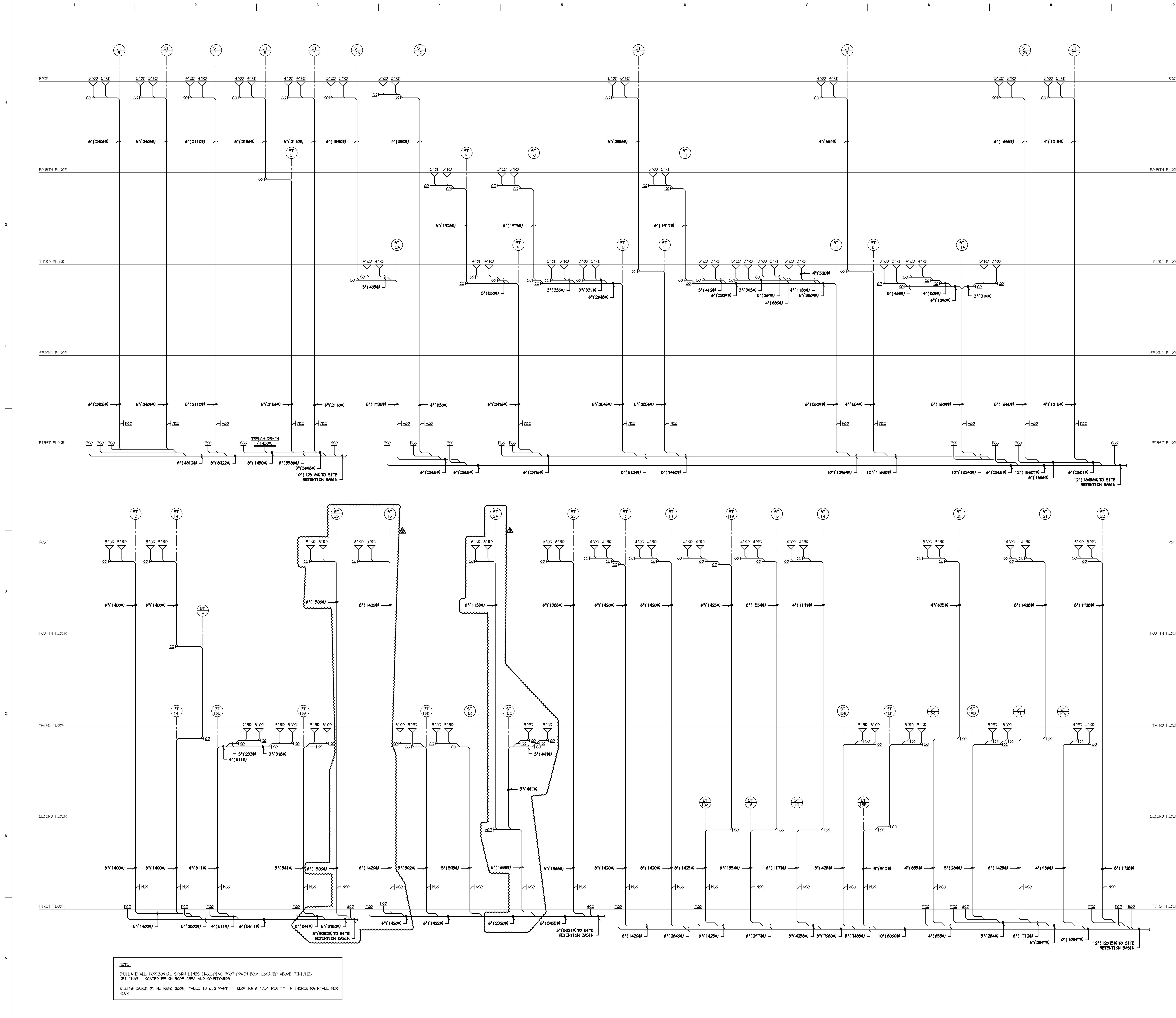
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PLUMBING
STORM RISER
DIAGRAM

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Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

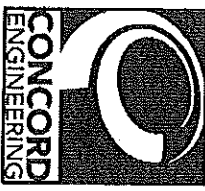
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CSK-P-101A-1

Through

CSK-P-104A-2

9/17/12



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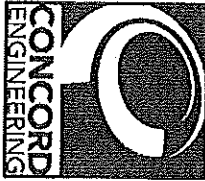
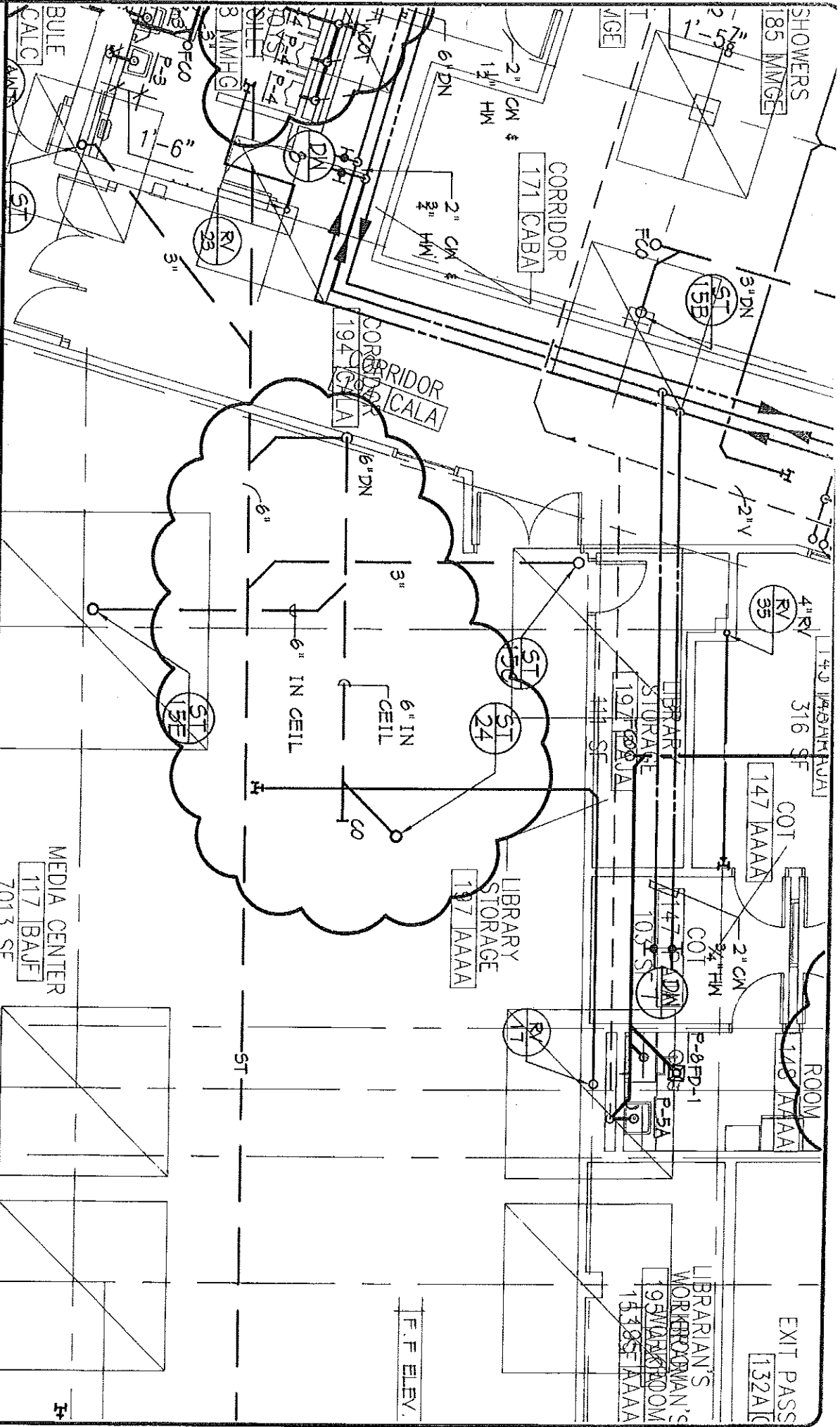
Professional Engineer
 Michael Pascale P. E.
 New Jersey P.E. No. 35798
 Registration & License No.

| No. | Description | Date |
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| | | |
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| | | |

PROJECT TITLE
**ELIZABETH
 ACADEMIC HIGH SCHOOL**

SKETCH TITLE
**PLUMBING GROUND FLOOR
 PLAN - PART A - ST-16**

| | |
|---------------------|--------------|
| DWG REF. NO.: | P-101A |
| PROJ NO.: | 1C12142 |
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| CHK BY: | |
| DATE: | |
| SKETCH NO.: | |
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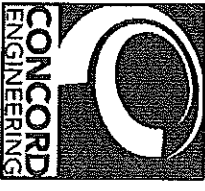
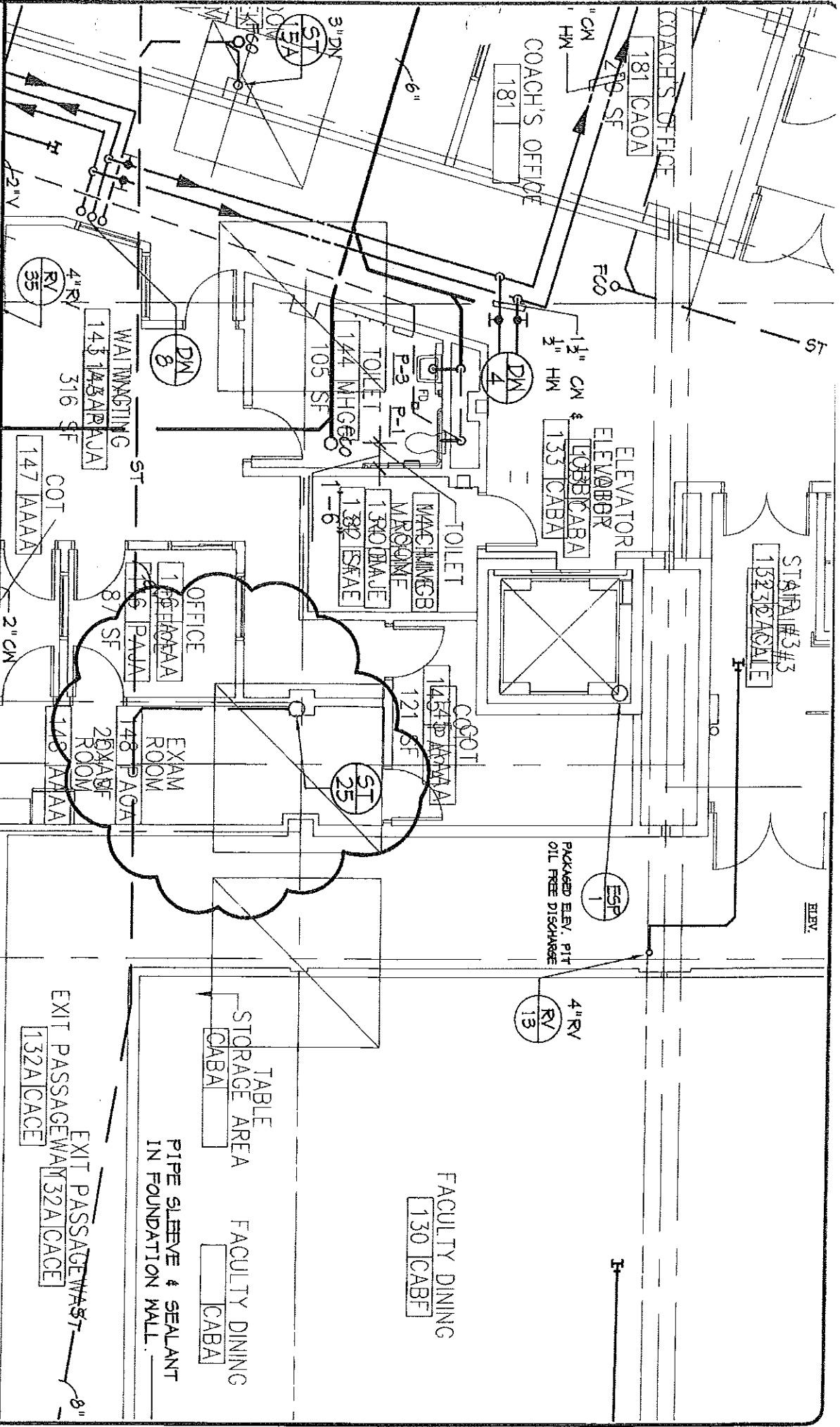
Professional Engineer
 Michael Puchette P.E.
 New Jersey P.E. No. 35798
 Signature & License No.

| No. | Description | Date |
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| | | |

PROJECT TITLE
**ELIZABETH
 ACADEMIC HIGH SCHOOL**

SKETCH TITLE
**PUMPING GROUND FLOOR
 PLAN - PART A - ST-24**

| | |
|---------------|---------------------|
| DWG REF. NO.: | F-101A |
| PROJ NO.: | 1012192 |
| SCALE: | 1/8" = 1'-0" |
| DWN BY: | |
| CHK BY: | |
| DATE: | |
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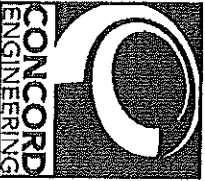
Professional Engineer
 Michael Ruchette P. E.
 New Jersey P.E. No. 35798
 Signature & License No.

| No. | Description | Date |
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PROJECT TITLE
**ELIZABETH
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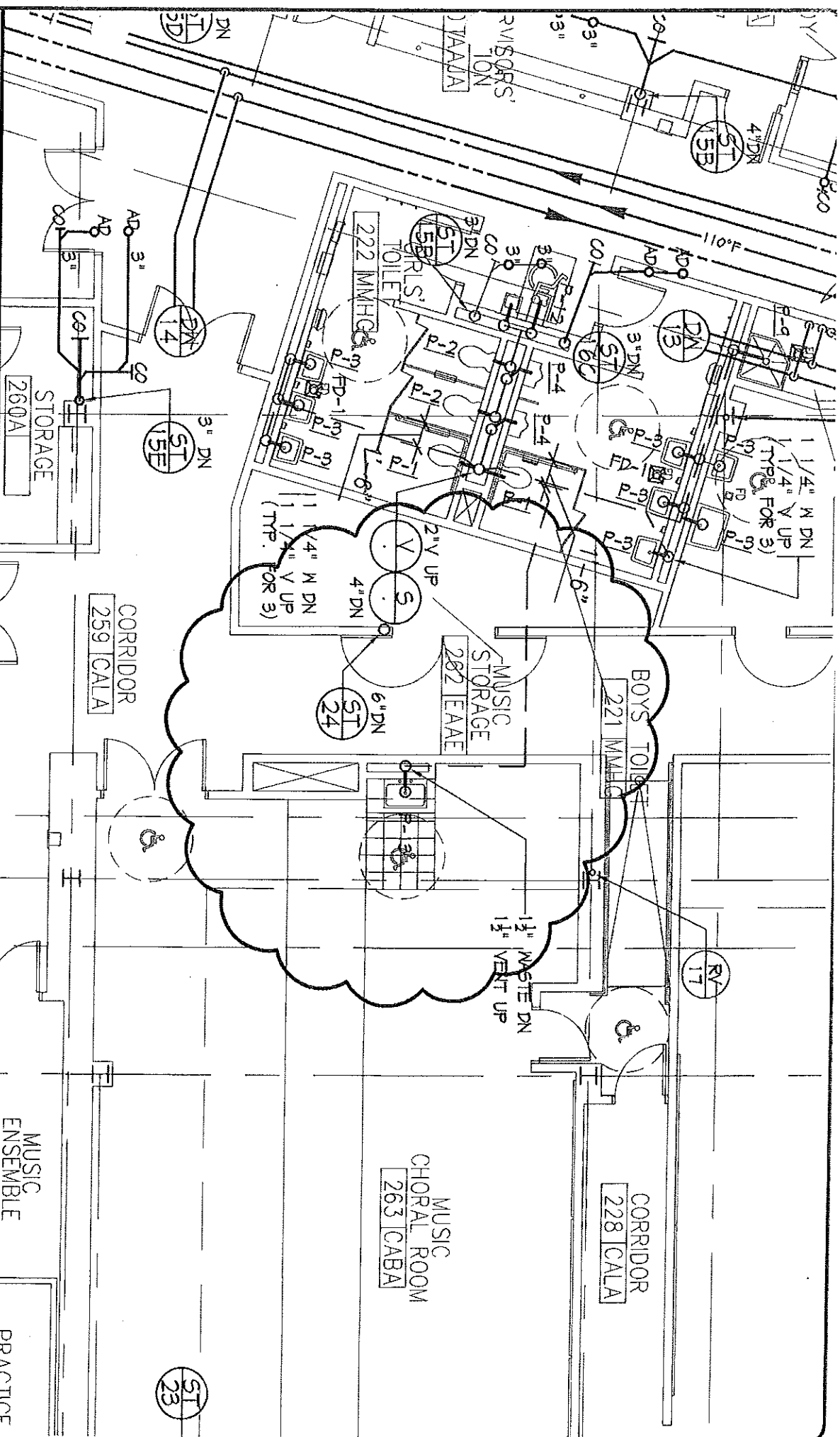
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**PLUMBING GROUND FLOOR
 PLAN - PART A - ST-25**

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| CHK BY: | - |
| DATE: | - |
| SKETCH NO.: | CSK-P-101A-3 |



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Professional Engineer

Michael Paschke P.E.
New Jersey P.E. No. 33798
Operations & License No.

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| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |

PROJECT TITLE
ELIZABETH
ACADEMIC HIGH SCHOOL

SKETCH TITLE
PUMPING SECOND FLOOR
PLAN - PART A - ST-24

| | |
|---------------|---------------------|
| DWG REF. NO.: | P-102A |
| PROJ NO.: | 1612192 |
| SCALE: | 1/8" = 1'-0" |
| DWN BY: | - |
| CHK BY: | - |
| DATE: | - |
| SKETCH NO.: | CSK-P-102A-1 |

CAREER
SOURCE CENTER
235 AAJA

GUIDANCE
RECEPTION
234 AAJA

TEACHER
WORKROOM
233 AAJA

STUDENT
ACT. CENTER
231 AAJA

CHILD STUDY
TEAM
245 BAJA

LEAM
246 BAJA

SUPERVISORS'
RECEPTION
230 AAJA

GUIDANCE
OFFICE
243 BAQA

GUIDANCE
OFFICE
242 BAQA

GUIDANCE
OFFICE
241 BAQA

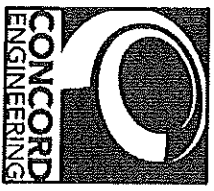
GUIDANCE
STORAGE
240 BAQA

COMMUNITY
SERVICE
239 BAQA

DROPOUT
PREVENTION
238 BAQA

PROGRAM
FACILITATOR
237 BAQA

TECH.
COORD.
236 BAQA



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| No. | Description | Date |
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PROJECT TITLE
**ELIZABETH
ACADEMIC HIGH SCHOOL**

SERVICE TITLE
**PLUMBING SECOND FLOOR
PLAN - PART A - ST-16**

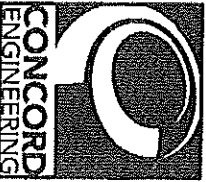
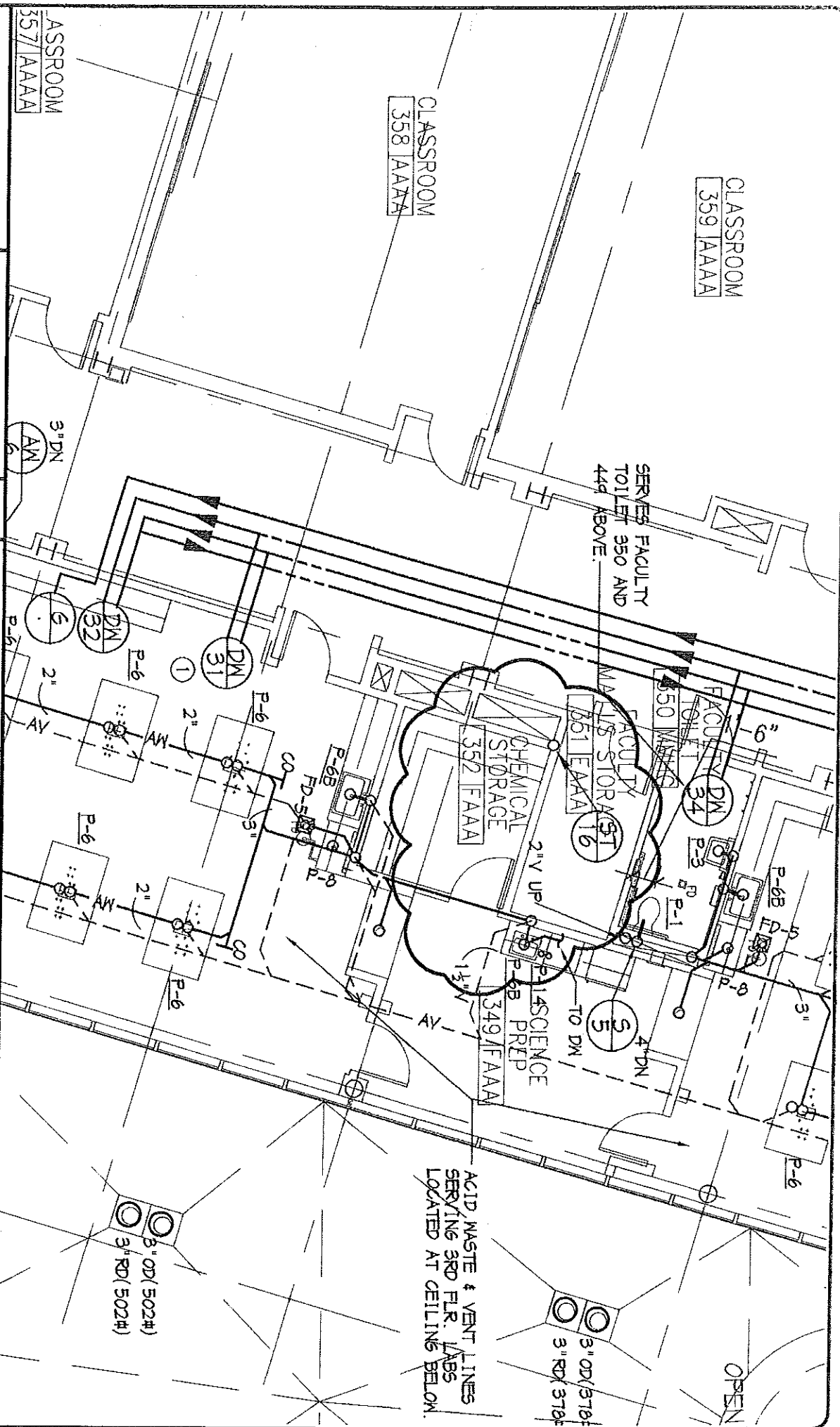
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| DWG REF. NO.: | F-102A |
| PROJ NO.: | 1612162 |
| SCALE: | 1/8" = 1'-0" |
| DWN BY: | |
| CHK BY: | |
| DATE: | |
| SKETCH NO.: | |
| CSK-P-102A-2 | |

CLASSROOM
359 | AAAAA

CLASSROOM
358 | AAAAA

ASSROOM
357 | AAAAA

SERVES FACULTY
TOILET 350 AND
449 ABOVE.



P.A. 246A27938700
520 South Burrill Hill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

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Professional Engineer
Michael Paschke P.E.
New Jersey P.E. No. 35798
Supervisor & License No.

| No. | Description | Date |
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PROJECT TITLE
**ELIZABETH
ACADEMIC HIGH SCHOOL**

SKETCH TITLE
**PUMPING THIRD FLOOR
PLAN - PART A - ST-16**

| | |
|---------------|---------------------|
| DWG REF. NO.: | P-108A |
| PROJ NO.: | 1612192 |
| SCALE: | 1/8" = 1'-0" |
| DWN BY: | - |
| CHK BY: | - |
| DATE: | - |
| SKETCH NO.: | CSK-P-105A-1 |

ACID WASTE & VENT LINES
SERVING 3RD FLR. LABS
LOCATED AT CEILING BELOW.

3" OD (502#)
3" RD (502#)

3" OD/378#
3" RD/378#

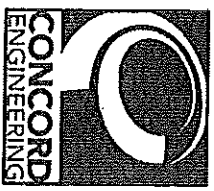
OPEN

BELOW

3" OD (348#)
3" RD (348#)

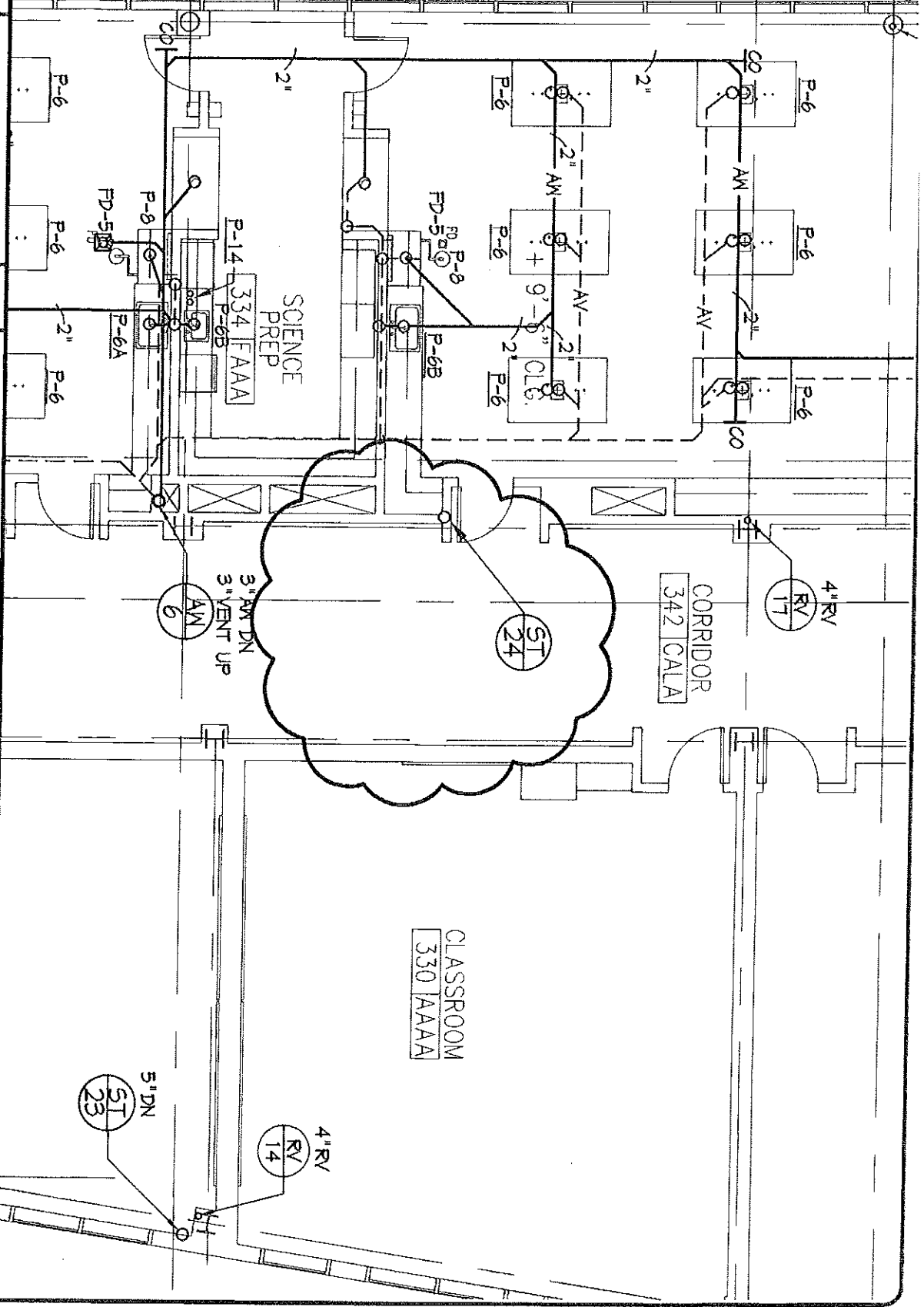
EAST COURTYARD

3" OD (479#)
3" RD (479#)



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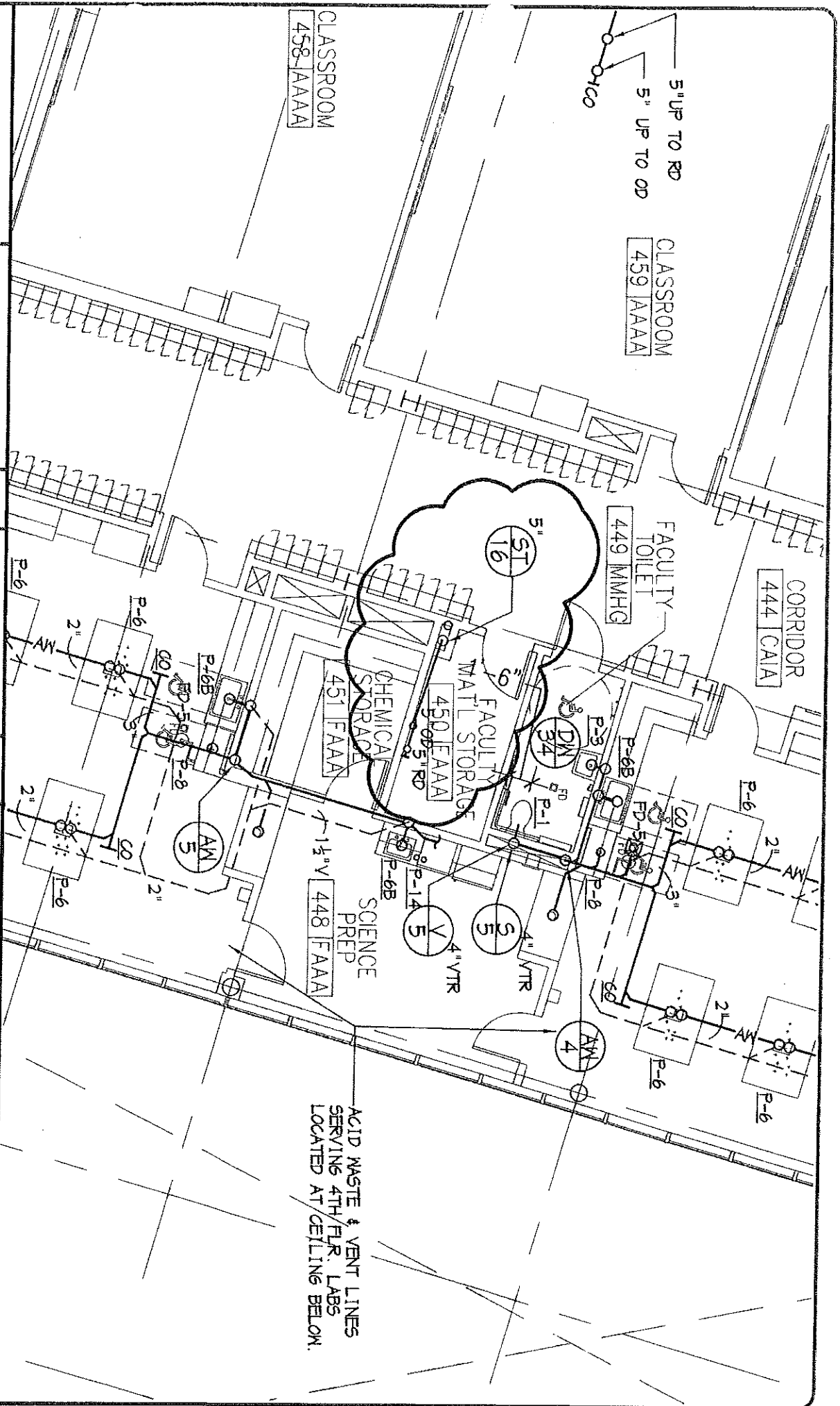
Professional Engineer
Michael Paschke P.E.
New Jersey P.E. No. 53798
Signature & License No.

| No. | Description | Date |
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PROJECT TITLE
**ELIZABETH
ACADEMIC HIGH SCHOOL**

SKETCH TITLE
**PUMPING THIRD FLOOR
PLAN - PART A - ST-24**

| | |
|---------------|--------------|
| DWG REF. NO.: | P-108A |
| PROJ NO.: | 1012192 |
| SCALE: | 1/8" = 1'-0" |
| DWN BY: | - |
| CHK BY: | - |
| DATE: | - |
| SKETCH NO.: | CSK-P-105A-2 |



5" UP TO RD
5" UP TO OD

CLASSROOM
459 | AAAAA

CLASSROOM
458 | AAAAA

CORRIDOR
444 | CAIA

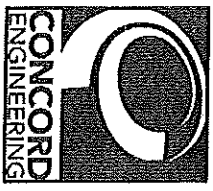
FACILITY
TOILET
449 | MMHG

FACILITY
MATERIAL STORAGE
450 | FAAAA

CHEMICAL
STORAGE
451 | FAAAA

SCIENCE
PREP
448 | FAAAA

ACID WASTE & VENT LINES
SERVING 4TH FLR LABS
LOCATED AT CEILING BELOW.



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Professional Engineer
Michael Muckala P. E.
New Jersey P.E. No. 35788
Supervisor & License No.

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PROJECT TITLE
ELIZABETH
ACADEMIC HIGH SCHOOL

SKETCH TITLE
PLUMBING FOURTH FLOOR
PLAN - PART A - ST-16

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|---------------|--------------|
| DWG REF. NO.: | P-104A |
| PROJ NO.: | 1C12192 |
| SCALE: | 1/8" = 1'-0" |
| DWN BY: | - |
| CHK BY: | - |
| DATE: | - |
| SKETCH NO.: | CSK-P-104A-1 |

4" VENT LINES
1/4" FLR. LABS
CEILING BELOW.

SELF-CONTAINED
SPECIAL ED. CLASSROOM
435 | AAAAA

COMPUTER
SCIENCE / APPS. LAB
434 | GAAA

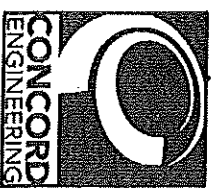
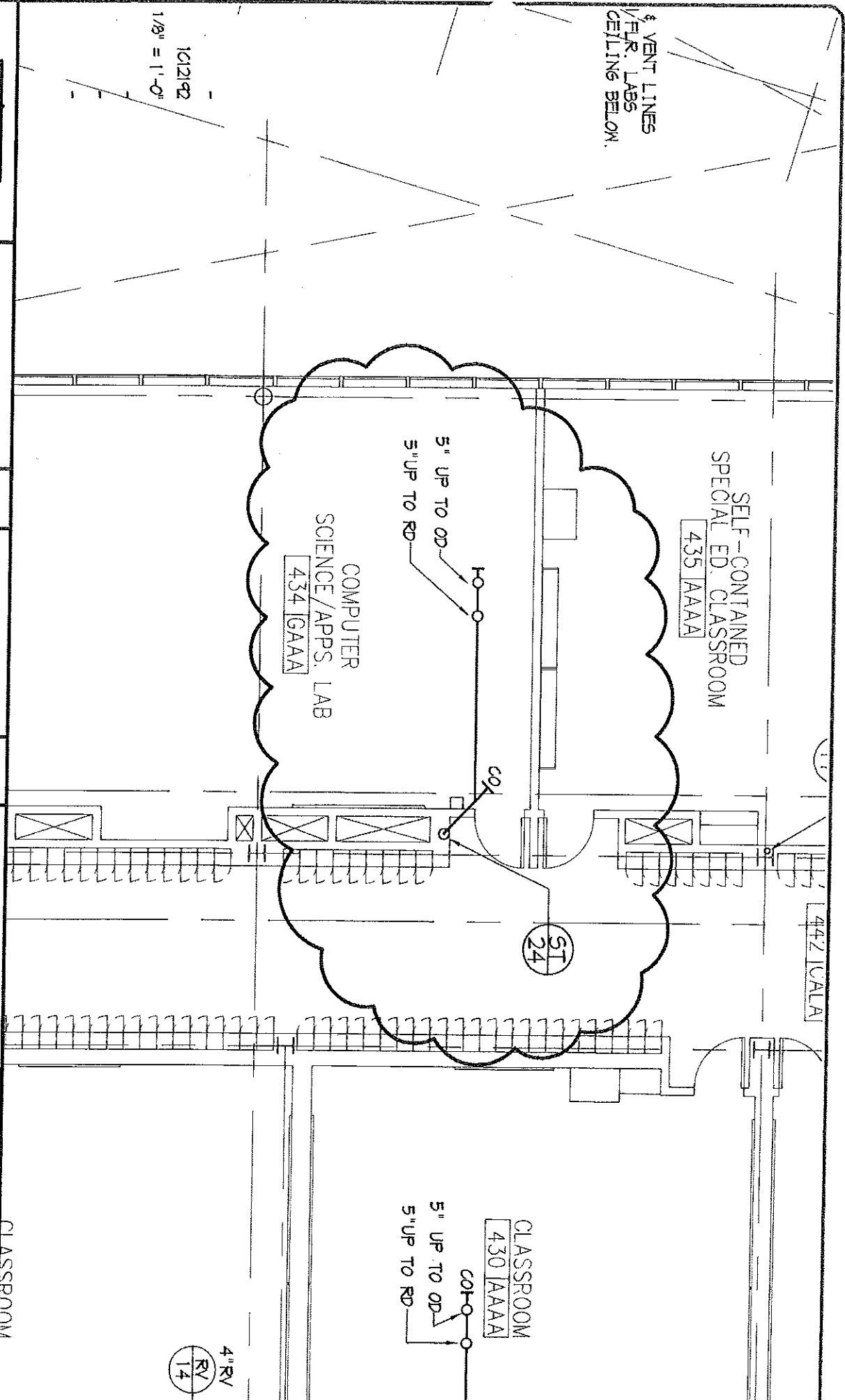
ST
24

442 | CALA

CLASSROOM
430 | AAAAA

1/8" = 1'-0"

4" RV
RV
14



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Professional Engineer
Michael Pashenko P. E.
New Jersey P.E. No. 33798
Member of Licensed No.

| No. | Description | Date |
|-----|-------------|------|
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PROJECT TITLE
**ELIZABETH
ACADEMIC HIGH SCHOOL**

SKETCH TITLE
**PLUMBING FOURTH FLOOR
PLAN - PART A - ST-24**

DWG REF. NO.: F-104A
PROJ NO.: 1012192
SCALE: 1/8" = 1'-0"
DWN BY: -
CHK BY: -
DATE: -

SKETCH NO.:
CSK-P-104A-9



Elizabeth Academic High School
Elizabeth School District

EL-0006-C01

Addendum #5

Attachment #22 – Revised Drawing P-203
Plumbing Domestic Water Riser
Diagram

9/17/12

SDA
NJ Schools Development Authority
ELIZABETH
ACADEMIC HIGH
SCHOOL

Owner
State of New Jersey Schools
Development Corporation
1 West State Street
Trenton, NJ 08625
(609) 943-5955

Project Management
Bovis Lend Lease
512 Morris Avenue, Suite 2B
Elizabeth, NJ 07208
(908) 354-3600

Architect
SOM
SKIDMORE, OWINGS & MERRILL PA
14 Wall Street
New York, NY 10005
(212) 298-9300

Structural Engineering
Consulting Engineers
Collaborative, Inc.
730 Boulevard
Kenshworth, NJ 07033
(908) 298-1600

Mechanical & Electrical Engineering
Plumbing and Fire Protection
Concord Engineering Group, Inc.
520 South Burnt Mill Road
Voorhees, NJ 08043
(856) 427-0200

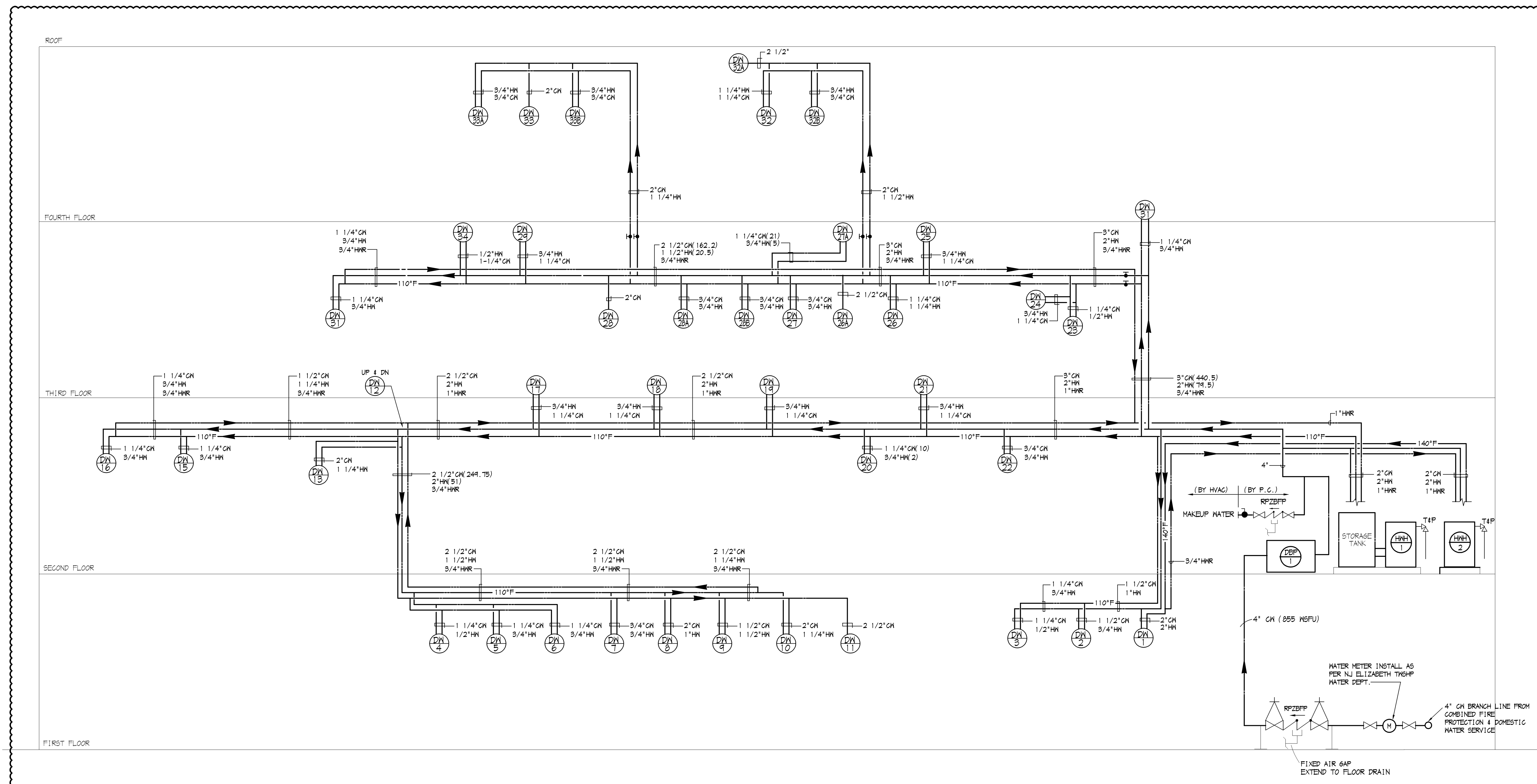
Surveying and Civil Engineering
Langan Engineering
River Drive Center 1
Elmwood Park, NJ 07407
(201) 794-6900

Landscape Design
MKW & Associates
39 Park Avenue
Rutherford, NJ 07070
(201) 933-7809

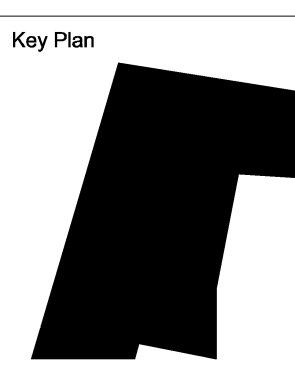
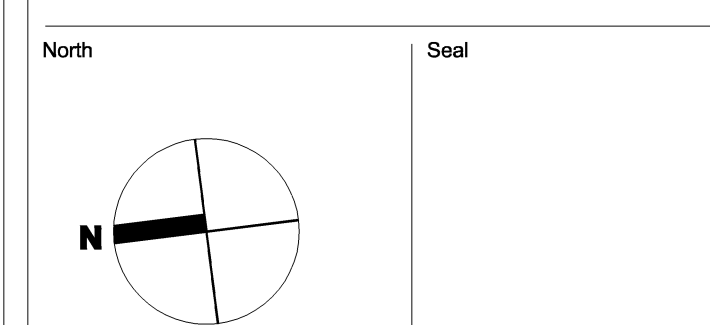
Information Technology
Intertech Associates, Inc.
77-56 Schenck Road
Suite A-14
Freehold, NJ 07728
(732) 431-4236

Food Service Consultants
Hopkins Food Service
Specialists, Inc.
27 West 24th Street
New York, NY 10010
(301) 320-8200

Fire Protection and Life Safety
Code Consultants, Inc.
330 West 38th Street
New York, NY 10018
(212) 218-5556



1 DOMESTIC WATER RISER DIAGRAM - DISTRIBUTION MAIN
P-203 SCALE: NONE



District Superintendent Signature
FRANCISCO MONTEZ
District Board President Signature
FRANCISCO MONTEZ

2 09/17/2012 ISSUED FOR ADDENDUM 5
1 JULY 13, 12 ISSUED FOR BID

No. Date Issue
Sheet Name
PLUMBING
DOMESTIC WATER
RISER DIAGRAM

Copyright, Skidmore, Owings & Merrill Architects, LLP 2009
Date: Sheet No:
Scale: 1/8" = 1'-0"
SOM Job No.: 209065
File name: P-203