LAVALLEE | BRENSINGER ARCHITECTS

ADDENDUM NO. 6
March 24, 2016

Re: Sanford High School and Technical Center
12-067-00

To: Bidders and All Others to Whom Bidding Documents have been issued.
All items in this Addendum shall supersede or clarify the Bidding Documents as originally issued. The cost of the Work of all trades affected by the changes in this Addendum shall be included in the Base Bid or Alternates, on the Proposal Form, as applicable. Failure to do so may subject the Bidder to disqualification. This Addendum forms a part of the Contract Documents. It supplements and/or modifies them as follows:

Item No. 6.1 **Reference Exterior Curtainwalls:** Question: We believe exterior curtain wall Type C1 has a structural issue that will not allow any depth 4-sided SSG mullion to be used and meet the loading. This pertains to the left side of the frame that spans a total vertical height of 32'-5 ½". Checking the structural drawings against the opening we find one horizontal tube steel at 14'-8" to top of that tube. There are two potential issues with the first being 23'-3" of unsupported curtain wall above that horizontal steel tube. The second is the tributary widths of 7'-0 ½" which are very large. This information has been verified with the basis of design manufacturer. We have a couple of suggestions one being providing another horizontal tube steel located in the center of the 23'-3" dimension. The other would be to introduce an additional vertical mullions that would align with the vertical in between the single doors. Please review and comment.
Answer: An additional horizontal tube steel will be introduced at C1, C6 and C7 at the following top of steel heights: C1 = 31'-7" AFF, C6 = 27'-9" AFF, C7 = 19'-3" above first floor. Revised structural drawings/sketches and details will be issued in Addendum 7. Specification section 08 44 13 2.02 Curtain Wall indicates a framing depth of 6 inches. Where required by the manufacturer to meet the required specified performance criteria for spans or configurations indicated by the Drawings, a 7.25" depth system will be allowed. The increased depth if required by the manufacturer or condition shall be carried in the base bid. The base bid shall include any/all frame depths, required reinforcement or other accessories and materials necessary to meet the specification performance in conjunction with the Drawing configurations indicated.

Item No. 6.2 **Reference Specification 23 01 00:** Question: 3D Drawing coordination: Spec section 23 01 00, 1.06-D1a – Requirements for models and reports are unclear. What format and how often are these to be submitted? Is it only required when coordination effort is complete, and final coordination drawings are sent to the Architect for approval per 01 30 00?
Answer: The format required is Revit with Navisworks clash detection. Coordination drawings are for the benefit of the Contractor and are to be managed by the Contractor during the course of the project.

Item No. 6.3 **Reference Drawing E1.14:** Question: E1.14 deploys the C6 explosion proof light fixture in the Finishing Room. Is this a classified room? Should the devices and wiring methods be explosion proof?
Answer: The room is classified. The devices and wiring methods are to be explosion proof (Division 2, Class 1, Group A).

Item No 6.4 **Reference Electrical** Question: H light fixtures: is the EC responsible for the DMX cabling? Will High Output furnish premade whips, or loose connectors? Please confirm our scope regarding the control of the "house" light fixtures?
Answer: The electrical contractor under Filed Sub Bid Package E is responsible for the DMX cabling of the H# fixtures back to the control point, where the theatrical contractor will terminate the cabling at the equipment. No additional whips or connectors are required.

Item No. 6.5 **Reference Mechanical:** Question: Please Confirm if the HWP-3 & 4 would still require VFD control or starters
Answer: Please refer to modified Mechanical Schedule Drawing M5.01

Item No. 6.6 **Reference DrawingA0.60** Question: Could you please provide locations for any required corner guards? They are not identified on the floor plans nor interior elevations.
Answer: Corner guards shall be provided where indicated in specification section 10 26 01 2.02 B1. In addition, accessory tags have been added to the floor plans to further clarify some locations. Refer to attached revised drawings A1.10, A1.11, A1.12, A1.13, A1.17, A1.20, A1.21, A1.23, A1.27. Add Accessory Type 43A, a 90 degree 6'-10" tall stainless steel corner guard to the Accessory Legend on A0.60. Add Type 43A to specification 10 26 01 2.02A. The color of corner guard types 40B, 41B, 42B shall be selected from manufacturer's full range. Allow for 5 different colors.

Item No. 6.7 **Reference Exterior Curtainwalls** Question: Exterior curtain walls Type C3, C6 & C14 have similar issues but not as bad as C1. Even running the top of C3 & C14 horizontally we would have go to a deeper mullion with the heaviest internal steel reinforcement. C6 is the same but has to run vertically.
Answer: Additional vertical mullions have been introduced to C3, C12 and C14. Refer to revised drawing A0.38 attached. See also response to addendum item 6.1 for specification modifications to depth of systems and additional steel at C6.

Item No. 6.8 **Reference Drawing M4.01:** Question: Can RFS please advise on size of ET-1 and ET-2 as shown on M4.01; I can not locate schedule.
Answer: Please refer to modified Mechanical Schedule Drawing M5.01

Item No. 6.9 **Reference Drawing M4.01:** Question: Can RFS please confirm that AS-1 should be rated for 800 gpm (shown on M4.01); I can not locate schedule.
Answer: Please refer to modified Mechanical Schedule Drawing M5.01

Item No. 6.10 **Reference Drawing M5.01:** Question: The DHU unit schedule indicates the curbs shall be 36" tall and horizontal ducted (Note 15 on M5.01). However the RTU plans showing the **DHU** units all appear to be **vertical ducted** down through the roof. These are large units and 36" tall curbs are going to make them very difficult to service. The reason for tall curbs is when you have to make a duct transition in the curb to go from vertical to **horizontal**. A few of the **AHU** units are like this (horizontal ducted) but none of the **DHU** units are. Even with 24" curbs the units will be hard to service.
Answer: Revise note to read "With spring isolated acoustical roof curb."

Item No. 6.11 **Reference Drawing M5.01:** Question: On pump schedule, Drawing M5.01, the pumps HWP-3 & 4 are scheduled as KV 3006. Either the conditions are wrong or the incorrect pump model was entered into that space. If the conditions are correct, I'd recommend the same pumps as were scheduled for CP-2? It the conditions are incorrect, I can recommend at RFS's discretion a suitable pump.
Answer: Please refer to modified Mechanical Schedule Drawing M5.01

Item No. 6.12 **Reference Drawing S1.25:** Revise beam size in wing C to W18X86 as shown in attached SKS-01. Refer to revised drawing A1.64 for revised soffit height. Refer to revised A1.24 for added F3 partition in Office C225.

Item No. 6.13 **Reference Architectural Drawings:** See sketches revising 9 locations for electrical rooms (deleting interior enclosures and doors). The following doors (and their related hardware sets) were deleted: Door A174A, A193A, C114D, D146A, E127C, B228B, C223B, D247A, E227C. See attached revised drawings A1.12, A1.14, A1.16, A1.17, A1.23, A1.24, A1.26, and A1.27 for changes including elimination of partitions.

Item No. 6.14 **Reference Specification 04 20 00:** Question: Cavity Wall Insulation is not listed in Spec Section 04 20 00. Please clarify if supplying or installing cavity wall insulation should be included in Filed Sub Bid Package A Unit Masonry
Answer: Providing and installing insulation should be the responsibility of the General Contractor and excluded from Filed Sub Bid Package A.

Item No. 6.15 Reference Specification 04 20 00, J8/A3.34, D1/A3.34, E11/A3.37, D1/A3.37: Question: Spec Section 04 20 00/2.04A calls out ASTM A Grade 60 rebar. In the plans (see for example J8/A3.34) rebar is tagged as being part of Spec Section 03 30 00 which is not included in Filed Sub Bid Package A. Please clarify if rebar in CMU walls is to be supplied and installed as part of Filed Sub Bid Package A.
Answer: All Rebar in CMU walls shall be supplied and installed as part of Filed Sub Bid Package A. The notes on reinforcement in these details should point towards 04 20 00 not 03 30 00.

Item No. 6.16 Reference Drawing A0.02: Question: On A0.02 there are some discrepancies with the descriptions of CMU walls to be grouted solid. For wall types M18,M18.S and M19 the wall is tagged as being solid grouted for acoustical separation, the wall section is shown visibly to be grout filled and the material is tagged as "04 20 00 8" CMU grouted solid". For wall types M24 and M24.S the wall type is not labeled as being grouted solid for acoustical separation, but it is shown visibly to be grouted and the material is tagged as "04 20 00 12" CMU Grouted Solid". Wall Types M25, M26 and M34 are described as being solid grouted for acoustical separation, are shown visibly to be grouted, but the material description does not include the phrase grouted solid (04 20 00 12" CMU). Wall Type M27 does not include the label of solid grouted for acoustical separation, the material is not tagged as grouted solid, but it is visibly shown to be grout filled. Please clarify if all these wall types are to be grouted 100% solid
Answer: Solid grouted wall types are: M18, M18S, M19, M24, M24.S, M25, M26, M34, M41.

Item No. 6.17 Reference Specification 04 20 00: Question: Spec Section 04 20 00-3.15B says that drip flashings are to extend across the cavity and turn up face of cavity wall surface at least 4". The details in the drawings (see C11/A3.32 or J11/A3.32 for example) appear to show drip edge extending a few inches from face of masonry where it terminates and is overlapped by the SS Vent Flashing. Please clarify which method of flashing is correct.

Answer: Drip Flashings should extend behind the SS Vent Flashing and turn up for at least 2" at that location.

Item No. 6.18 Reference Drawing D1/A3.35 and J8/A3.35: Question: Some metal flashings which are not part of masonry assemblies are tagged on the drawings as 04 20 00 Drip Flashing (see D1/A3.35 or J8/A3.35 for example). Please clarify if Filed Sub Bid Package A Unit Masonry is responsible for supplying or installing metal flashings which are not part of masonry assemblies.
Answer: For consistency, these flashings tagged 04 20 00 shall be provided/installed under Filed Sub Bid Package A. Also see updated drawings which did shift some flashing tags.

Item No. 6.19 Reference Drawing J12/A3.34 F12/A3.34: Question: Some metal flashings which are part of masonry assemblies are tagged on the drawings as 07 62 00 Aluminum Flashing (see J12/A3.34 or F12/A3.34 for example). This product or spec section is not listed as being part of Filed Sub Bid Package A Unit Masonry. Please clarify if aluminum flashings are required at these locations. If aluminum flashing is required, please clarify who is to supply and install.
Answer: The notes stating 07 62 00 Alum Flashing should refer to 04 20 00 Drip Flashing.

Item No. 6.20 Reference Drawing J1/A3.35 Question: J1/A3.35 shows the metal flashing embedded in masonry over the roof as 07 62 00. E7/A3.36 shows this same flashing as 04 20 00. Please clarify who is to supply this flashing.
Answer: See updated Drawings

Item No. 6.21 Reference Drawing E7/A3.36 Question: E7/A3.36 shows 04 20 00 Vent Flashing being installed to the face of sheathing over the roofing material and left exposed. Is this correct? Is Division 04 responsible for supplying and installing this material even though it is not part of the masonry assembly?
Answer: See updated Drawings

Item No. 6.22 Reference Drawing S00/Specification 04 20 00 Question: On S00, Masonry Note 10 says to supply Mil-Galvanized Truss Wire for horizontal joint reinforcement. Spec section 04 20 00-2.04-B says to supply Hot Dipped Galvanized Ladder Wire. Please clarify which is correct.
Answer: Provide Hot Dipped Galvanized Wires.

Item No. 6.23 Reference Drawing S2.0/Specification 04 20 00: Question: S2.0 shows a typical precast lintel for overhead doors. Please clarify who is supplying and installing the structural precast.
Answer: The Masonry Contractor shall supply and install structural pre-cast lintels located in masonry walls under Filed Sub Bid Package A.

Item No. 6.24 Reference Drawing 04 20 00: Question: Spec Section 04 20 00-3.12L says that Structural Steel Clips shall laterally secure tops of CMU walls. Is supplying and installing these clips part of Filed Sub Bid Package A?
Answer: Structural Steel Clips should be provided by section 05 12 00, and not included under Filed Sub Bid Package A

Item No. 6.25 Reference Drawing S00/Specification 0 4 20 00: Question: Spec Section 04 20 00-3.13A says to install horizontal joint reinforcement at 8" on center in single wythe masonry. Is the intent to install horizontal joint

reinforcement in every course of single wythe CMU walls? Masonry Note 7 on S00 says to install joint reinforcement in every other course. Please clarify which is correct.
Answer: Provide joint reinforcing at 16" o.c. horizontal in all concrete masonry construction.

Item No. 6.26 Reference Specification 04 20 00: Question: Spec Section 04 20 00-3.14E says to set veneer anchors in a bed of sealant. The specified veneer anchor is installed after the insulation so this will not be possible.
Answer: This note requests that sealant be applied to the stud cavity side where the fastener penetrates, not the insulation side.

Item No. 6.27 Reference Specification 04 20 00: Question: Spec Section 04 20 00-3.18D says to install sealant and backer rod specified in Section 07 90 05 at control and expansion joints in masonry. Are backer rod and sealant to be supplied and installed as part of the 04 20 00 Filed Sub Bid, or will this work be performed by Division 07?
Answer: The backer rod and sealant should be provided by Division 07, not Filed Sub Bid Package A. The Mason must coordinate with the installer of these systems.

Item No. 6.28 Reference Specification 04 20 00: Question: Spec Section 04 20 00-3.09 says to install weep vents at 16" on center. The specified brick is 12" long so weep spacing will either have to be 12" or 24" at brick walls. Please clarify.
Answer: 12" at this sized brick

Item No. 6.29 Reference Specification 04 20 00: Question: Spec Section 04 20 00-2.01-E3 says to use masonry units with integral water repellant at exterior units. Does the term "exterior units" refer only to CMU exposed on the exterior of the building? Or would CMU on exterior walls which are covered on the exterior by masonry veneer or siding also need to contain water repellant? (see D1/A3.34 or E11/A3.37 for example)
Answer: All block in exterior assemblies shall have integral water repellant

Item No. 6.30 Reference Drawing S2.1: Question: The Continuous FTG Detail on S2.1 shows that all Auditorium walls are to be grouted solid. A1.10 shows wall type M20.S running parallel to Col Line B-1. Wall type 20.S does not require solid grouting. Please clarify.
Answer: This wall on column line A-6 should be grouted solid.

Item No. 6.31 Reference Drawing S2.1: Question: On S2.1 Typical Plan Details at CMU Walls Note # 6 says that rebar over masonry openings are to extend 24" past jambs. Note #1 below the CMU Lintel Schedules says masonry lintels require 8" bearing. Please clarify which is correct.
Answer: Above openings provide lintel per CMU lintel schedules indicated on S2.1; below openings provide (2)# 5's with 24" extension as indicated in the plan notes.

Item No. 6.32 Reference Drawing A4.30-4.32/Specification 04 20 00 Question: Spec Section 04 20 00-2.01-B3 says to supply CMU with polished ground faces on both exposed sides at interior applications. Details J9/A4.30 and F11/A4.33 show that Ground Face CMU is only needed at one side and that the side facing classroom, dining, conference, office is painted. These are shown as typical conditions. Please clarify where double sided ground face CMU is needed.

Answer: Detail J9/A4.30 indicates the ground face finish at corridor side, the end of the wall and the opposite side from the end of the wall to the adjacent construction (the storefront). This is similar to the conditions at G9/A4.30, D1/A4.32 and F11/A4.33. At detail A4.32, the ground face finish is on the north side of the wall, the end of the wall and the opposite side from the end of the wall to the adjacent construction (partition type M22). At detail G4/A4.32, the ground face finish is on the south side of the wall and the end of the wall.

Item No. 6.33 Reference Specification 04 20 00: Question: J7/A0.31 shows 1" masonry veneer. Please provide a specification and installation instructions for this material.
Answer: Refer to masonry spec. 1" units are included as a special shape. See detail J9/A4.20 for standard installation of 1" CMU. Install as shown in details, set into mortar, with L-Shaped Anchors (provided and installed by Mason) 8" o.c. vertically and 16" o.c. horizontally. The L-shaped Anchors and the other anchors shall be by Masonry Contractor under Filed Sub Bid Package A.

Item No. 6.34 Reference Specification 04 20 00: Question: Spec Section 04 20 00-2.05 A calls for stainless steel drip edge flashings to be 22 gauge stainless steel. 04 20 00-2.05 C says that stainless steel flashings are to be 26 gauge. Please clarify which is correct.
Answer: 26 gauge.

Item No. 6.35 Reference Specification 04 20 00: Question: Spec Section 04 20 00-2.04 F describes a single screw veneer tie with dual diameter barrel and factory EPDM washer at both weather barrier and insulation faces that is compatible with an adjustable pintel wire tie. Neither of the products listed match this description. The Pos-I-Tie only has an EPDM Washer at the insulation face and does not have a pintel tie (it does come with a wire tie, but it is closer to a triangle or vee tie). The X-Seal SIS also does not meet either of these requirements. Please clarify if the listed veneer anchors are acceptable, or if another product needs to be used
Answer: The specified Products shall be acceptable. Strike 2.04F from 04 20 00. Strike the reference to a washer at the weather barrier under 2.04 F-1. The manufacturers wire tie shall be acceptable in lieu of Pintel Tie.

Item No. 6.36 Reference Specification 04 20 00: Question: Spec Section 04 20 00 2.06 E calls for stainless steel termination bar to be used with flashings. The manufacturer's instructions for the specified vent flashing (Flash Vent SS from York Mfg.) say to use T-96 Termination Bar (also from York Mfg.) which is not stainless steel. Please clarify if this is acceptable
Answer: Manufacturer's recommended termination bar from York is acceptable.

Item No. 6.37 Reference Specification 04 20 00 Question: Spec Section 01 50 00 says that the general contractor is responsible for temporary enclosures and heat. 04 20 00-3.04 B says to maintain materials and surrounding air temperature to minimum 40 degrees . Please clarify if temporary heat is the responsibility of the general contractor or if it is to be included in the Division 04 Filed Sub Bid
Answer: Temporary Heat is the Responsibility of the General Contractor as previously clarified.

Item No. 6.38 Reference Architectural Drawings: Question: On interior walls tagged as ground face CMU, is it acceptable to use standard CMU above ceiling height?

Answer: The CMU at non-exposed locations can be non-ground face (standard facing).

Item No. 6.39 Reference Drawing S2.1: Question: Please provide a steel lintel schedule for Masonry openings in CMU walls which exceed the widths specified in the CMU Lintel Schedules on S2.1
Answer: Masonry lintels are shown S2.1 for widths up to 15'-6" in 12 inch CMU walls, and precast lintels are provided at exterior overhead doors. We are unaware of any spans that exceed the 15’6” width.

Item No. 6.40 Reference Specification 04 20 00: Question: Spec Section 04 20 00-2.02 A lists Belden Commodore Full Range Smooth Brick as the basis of design, but under acceptable products, lists Glen Gery Sunset Flashed FS 15. Please clarify which of these products is to be used.
Answer: Either products specified can be used.

Item No. 6.41 Reference Specification 04 20 00: Question: Spec Section 04 20 00-2.02 B lists Belden Claret Smooth Brick as the basis of design, but under acceptable products, lists Endicott Bordeaux Blend. Please clarify which of these products is to be used.
Answer: Either products specified can be used.

Item No. 6.42 Reference Addendum 2: Question: Addendum #2 clarifies that fire stopping is not to be included in Filed Sub Bids. Would this also apply to Safing Insulation and Sealants applied at the tops of other CMU wall types? No Division 07 specs are listed as included in Filed Bid Package A. Please clarify who is to supply and install these materials.
Answer: The Safing Insulation and Sealants references Division 07, therefore is not included in Filed Bid Package A.

Item No. 6.43 Reference Specification 04 20 00: Question: Spec Section 04 20 00 makes several references to Spec Section 04 23 00. This spec section is not included in the project documents.
Answer: 04 23 00 references should be removed. This information was integrated into 04 20 00.

Item No. 6.44 Reference Drawing A4.33: Question: F11/A4.33 shows a Wall Type M2 4” CMU pier in front of a M36 8” Ground Face Wall. Wall Type M2 does not call for Ground Face CMU. Please confirm that this 4” CMU wall does not need to be ground face to match the adjacent.
Answer: M2 wall in detail F11/A4.33 does not need to be ground face to match the adjacent.

Item No. 6.45 Reference Drawing A1.12, A1.22: Question: The North and South walls of the Auditorium (Column Lines A-E and F-E) are labeled as wall types M34. Please confirm that the Ground Face of these walls will be towards Rooms A121A and F101 and that the Auditorium CMU is to be painted (therefore does not need to be ground face).
Answer: The auditorium is painted (therefore does not need to be ground face). See also response to Item #6.32.

Item No. 6.46 Reference Drawing J7/A4.33: Question: Detail J7/A4.33 shows 2hr rated column wraps per UL X901. This UL Detail uses Autoclaved Aerated CMU with Thin Bed Mortar. Please confirm that these materials are the responsibility of Bid Package A Filed Sub Bid even though these products are not listed in Spec Section 04 20 00.

Answer: Strike reference to UL Assembly X901. 2 hour rating shall be achieved with standard block per table 720.1 (2). Autoclaved Aerated CMU with Thin Bed Mortar no longer required. Use specified block.

Item No. 6.47 Reference Drawing J7/A4.33: Question: At Detail J7/A4.33 please clarify if the Autoclaved Aerated CMU Abuts the CMU wall as shown on the detail for UL X901, or if the Autoclaved Aerated CMU completely surrounds the column.
Answer: Strike reference to UL Assembly C901. 2 hour rating shall be achieved with standard block per table 720.1 (2). Autoclaved Aerated CMU with Thin Bed Mortar no longer required. Use specified block.

Item No. 6.48 Reference Drawing K1.3: Question: The Food Service specs are calling for (3) fire systems to protect the (6) hoods in room D112. Could you please clarify which hoods share a common duct?
Answer: See specifications 11 40 00 stating which hoods each one serves. Additionally, M1.16 shows common ducts and exhaust.

Item No. 6.49 Reference Drawing A0.50/Specification 08 33 23: Question: Specification section 08 33 23 references a Servery C100 coiling door. Can you please provide more information on this door as it does not appear in the door schedules?
Answer: Revise references to "Servery C100" in specification section 08 33 23, to "Servery C100B". Refer to Sheet A0.50 and Addendum #5 for additional information.

Item No. 6.50 Reference Specification 09 05 61: Question: Please confirm that specification section 09 05 61 is to be applied to all floors receiving finish flooring.
Answer: Correct.

Item No. 6.51 Reference Drawing A1.23: Question: Just inside door B245 there are two wall hung specialties without a designation. Can you please provide information on these items?
Answer: Delete these two specialty items with no designation.

Item No. 6.52 Reference Drawings/Specification 08 34 73: Question: Specification section 08 34 73 calls for Sound Control Door Assemblies to be installed in Video Production Classroom 2044 and Video Production 2045 (Control Room). Please confirm which doors we are to bid per this specification section as the door schedule does not designate sound control.
Answer: Delete reference to "Video Production Classroom 2044, Video Production 2045 (Control Room)" from specification section 08 34 73. Provide Sound Control Door Assemblies as indicated in the door schedule.

Item No. 6.53 Reference Drawing A0.2.03 Question: Referencing the rating legend on A0.2.03 and A0.2.04 to roofs 20'0" or more AFF. How is the primary structure defined? Does it include only columns and members directly connected to columns? Does it include bar joists or just beams?
Answer: At roofs 20' or more, Primary Structure shall be defined as structural members connecting directly to columns. At these locations bar joists are excluded.

Item No. 6.54 Reference Drawing A1.12, A1.22: Question: Please confirm the bleacher seat count as the physical seat count on drawings A1.12 and A1.22 does not reflect the seat count called out on the legend shown in the upper right corner of each drawing.
Answer: There are no "bleachers" on A1.12 and A1.22. However, the Auditorium fixed audience seating count in the legend and seats shown have been corrected to align. Refer to the attached revised drawing A1.12 and A1.22. The seat count does not include wheelchair seating locations.

Item No. 6.55 Reference Addendum 5.85: Question: Item number 5.85 clarifies who is responsible for the composite manholes. However in the clarification are you stating that the GC is now responsible for furnishing and installing all precast concrete items per specification section 33 10 00? These precast items are typically furnished and installed by the site contractor and in this scenario, Filed Sub Bid Package F. Please restate the intent.
Answer: Addendum item 5.85 clearly states The General Contractor shall be responsible to furnish and install the manholes specified in 26 11 90 and 33 10 00, while Filed Sub Bid Package E and Filed Sub Bid Package F shall exclude these manholes. As in most cases, the General Contractor may elect to use the site contractor to perform this work under an agreement in addition to the filed sub bid value between the GC and the Site Contractor. Regardless of the contractor performing the work, the costs for this work must be included in the General Contractors bid.

Item No. 6.56 Reference Addendum 5.69 Question: We are assuming item 5.69 also covers the four locations containing 71-12i (rooms A205, A231, B235, and D212).
Answer: Yes.

Item No. 6.57 Reference Addenda 4.32 and 5.19: Question: We request a clarification on items 4.32 and 5.19 regarding specification section 33 46 10. We are assuming that all the under slab work, including the piping, is by Filed Sub Bid Package F as per 33 46 10 and all the riser work is by Filed Sub Bid Package D per specification section 22 41 00. Is this correct?
Answer: Incorrect. Addendum 4.32 and 5.19 clarified that the Radon System 33 46 10 is the responsibility of the General Contractor and should be excluded from Filed Sub Bid Packages. Also related to this section, submittals should include field verified shop drawings showing the piping to go within the building. All piping shall be within partitions and not exposed to view. Coordination of these locations will be required. It should also be noted that to comply with the Maine Radon Rules and Radiation Act (cited in this section), the installer of these systems must be a "Registered Mitigation Contractor with the State of Maine". The installer must have completed this registrations before starting construction of the system.

Item No. 6.58 Reference Specification 07 14 00: Question: Section 071400 Fluid Applied Waterproofing 1.01A indicates locations for waterproofing. Item 2 states basement level complete, as well as, walls with earth on one side and habitable space on the other. At the main auditorium there is one wall that fits the characterization of "earth on one side and habitable space on the other"-should this wall between A-9 and A-8 as seen on A2.20/C7 also be included in the waterproofing scope?
Answer: Yes.

Item No. 6.59 Reference Specification 07 25 00: Question: Section 072500 Weather Barriers: The question is regarding membranes that transition into the glazing pocket examples are A0.36/G11 and A3.36/J8 and J11. The membrane referenced is called transition membrane section 072500; which membrane do you want used here? 2.03B or 2.03F

material? If 2.03F then it appears this would indicate the installation of this transition membrane would be the responsibility of the section 08 44 13 subcontractor, is that correct?
Answer: Type under 2.03B at Curtainwalls and Louvers. The perimeter transition system under 2.03F applied to aluminum windows under 08 51 13 only.

Item No. 6.60 Reference Drawings A0.30 and A0.36: Question: Reference drawing A0.30 for architectural louvers. Please confirm that the louvers shown on this drawing are those to be provided under division 08 91 00 Louvers. Exterior drawing A2.07 shows louver LV5 but drawing A0.30 states that it is not used. The mechanical drawings do not appear to show any ductwork to this location
Answer: Mechanical drawing M1.13 indicates an intake at this location. Refer to LV5 on attached revised A0.36.

Item No. 6.61 Reference Specification 26 71 00: Question: Section 267100 Fire Alarm: a. Plan FA2.02 Detail 2: Smoke Control System Panel calls for a "fault" light. Please describe what would cause this "fault". b. Do the requirements include positive feedback of motors or dampers being on or off, doors in open or closed status? The spec does not ask for this, but it is a common FA specification that requires significant equipment and programming. c. Note that the door contacts are being provided under the door hardware spec. If FA needs to monitor the door position, at a minimum, the door contacts need to be double contact.
Answer: Fault would indicate on (failure) power status of fans, doors and operators and door position status. System requires positive feedback of status of all devices. Contacts are specified to be double pole double throw contacts.

Item No. 6.62 Reference Specification 26 41 00: Question: Spec 264100 Section 2.05-K: Company switch at service entrance is not shown on plans. Please verify there is one (1) switch required, and specify amperage.
Answer: The specification states that the company switch (if there is one) needs to be service rated. There are no company switches at this time in the project.

Item No. 6.63 Reference Fire Protection Drawings: Question: There is no reference to stand-alone structures, i.e. Stadium Electric Building, Field Storage Building, or Press Box on Fire Protection drawings. Please verify there is no connection or system required.
Answer: The Field Storage Building, the Stadium Electric Building, and the Press Box do not have sprinkler systems.

Item No. 6.64 Specification 10 14 24: Photopolymer Signs ADA Compliant Signs as Manufactured by Welch Signage shall be acceptable for Spec Section 10 14 24 2.02. 10 14 24 2.02A-1 shall change to allow for the Photopolymer Material. Dimensions and all other requirements listed under this specification and the drawings shall still apply. Note that all signage manufacturers listed under Spec Section 10 14 24 2.02 shall also be allowed to use Photopolymer Materials.

Item No. 6.65 Reference Specification 01 21 00: Question: Is the quantity of unsuitable material excavation (peat, uncontrolled fills etc…) and disposal to be carried as part of the lump sum base bid or will it be paid for separately under the 16,000 CY unsuitable soils allowance?"
Answer: The 16,000cy allowance under 01 21 00 is an assumed amount of Organic Soils / Peat that must be exported from the site to meet the requirements in the drawings and geotechnical report. This quantity of excavation and exported material shall be included in base bid for Filed Sub Bid Package F. There is a significant amount of material

that is conceived to be reusable onsite as common barrow. Material which can be processed on site for re-use shall not apply to the 16,000 cy allowance and shall be included in the base bid. The Unsuitable Soils allowance should be clarified to include only the high organic material / peat which cannot be amended or re-used onsite. Under section 01 21 00, 2.02 B, add item 8. "The Contractor shall notify the Civil Engineer and the Geotechnical Engineer when unsuitable soils are encountered. Prior to exporting from the site, the Geotechnical Engineer and the Civil Engineer shall have the opportunity to review the material and verify that it cannot be re-used on site. Material deemed to be re-usable or amended and re-usable on site shall not contribute to the 16,000 cubic yards listed within this allowance."
Both allowances 01 21 00, 2.02 and 01 21 00, 2.01 shall be part of the base bid for Filed Sub Bid Package F. Further Clarification related to this can be found under Addendum item 6.75.

Item No. 6.66 Reference Civil Drawings: All areas referencing "Pedestrian Guardrail" shall be changed to " 48" Chainlink Fence" and follow specification 32 31 13 and all applicable addendum affecting Chain link fence Specifications.

Item No. 6.67 Reference Civil Specifications: See Attached 403 Specification –Maine DOT supplied pavement specifications related to the offsite improvements on Route 4.

Item No. 6.68 Reference Specification 12 61 00: Question: Under 126100, Subsection 1.03 it references many tests, such as ASTM E1352 and NFPA 261, which state testing a "mock-up" for cigarette smoldering, etc. The only means of testing this sort of requirement is testing for CAL 133. Can you please confirm that these tests are required? Cal 133 is very expensive, and is not required in Maine. We are being told that Maine uses CAL117.
Answer: Remove requirement for CAL 133 and replace with CAL117.

Item No. 6.69 Reference Specification 12 61 00: Question: Subsection 2.02.E. Calls for UV Inhibitors. Do we need to supply this in the chairs or bleacher seat modules? UV inhibitors are generally only required in outdoor applications.
Answer: UV inhibitors are not required at interior bleachers and seating.

Item No. 6.70 Reference Specification 01 23 00: Add the following Alternates to Section 01 23 00:

Q. Alternate No.17 (Morin Brick at Rear Elevations)
   1. State the amount to be DEDUCTED from the Base Bid to provide Spartan Blend Smooth by Morin Brick, modular size in lieu of Facing Brick Type 1 and Woodland Brown Smooth by Morin Brick, modular size in lieu of Facing Brick Type 2 at rear elevations (reference drawings marked as Alternate #2). See Section 04 20 00 - Masonry. See Architectural Drawings A2.07, A2.08, and A2.09 of locations this alternate.

R. Alternate No.18 (Morin Brick at Front Elevations)
   1. State the amount to be DEDUCTED from the Base Bid to provide Spartan Blend Smooth by Morin Brick, modular size in lieu of Facing Brick Type 1 and Woodland Brown Smooth by Morin Brick, modular size in lieu of Facing Brick Type 2 at rear front elevations (reference drawings marked as Alternate #3). See Section 04 20 00 – Unit Masonry. See Architectural Drawings A2.04, A2.05, A2.06, A2.09, and A2.10 for locations of this alternate.

See attached Revised Bid Forms for General Contractors and filed Sub Bid Packages (except Filed Sub-Bid Package F – which shall refer to bid form issued via addendum 2).

Item No. 6.71 Reference Drawings D12/A3.34, H12/A3.34, C4/A3.34, D1/A3.34, D1/A3.32 E5/A3.37: There are several Anchor Bolts shown in section details holding wood blocking that refer to section 05 12 00. These should point towards 06 10 54.

Item No. 6.72 Reference Drawings E11/A3.37: The Anchor Bolts shown in section details holding an 05 40 00 CFMF Angle that refer to section 05 12 00. These should point towards 05 40 00.

Item No. 6.73 Reference Specification 01 23 00: Question: In Spec Section 01 23 00, Alternate #2 is to provide Concrete Brick in lieu of the specified brick at "Rear Elevations". The Alternate Description says to see Drawings A2.07, A2.08 and A2.09 for locations of this Alternate. None of the Elevations on A2.08 are labeled as being part of this Alternate. Am I correct to assume that Elevation C8/A2.08 should be included in Alternate #2?
Answer: Correct, C8 and F1 on A2.08 brick areas shall be included as part of Alternate #2.

Item No. 6.74 Reference Drawing S2.1 and S3.0: Question: On Drawing S2.1 and S3.0, #5x 36" long rebar dowels are shown to be drilled and epoxied into the concrete slab at 32" on center for interior CMU partitions. Are these dowels to be supplied and installed by Sub Bid Package A?
Answer: Yes – these should be provided as part of Filed Sub Bid Package A.

Item No. 6.75 Reference Addendum 5.64: Addendum5, item 5.64 is a question about fill under the bleachers. There is a note on drawing C28 calling for the existing peat and organic soils to be removed and replaced with granular borrow per the geotech report as well as the stone and fabric on C12. Removal of this material shall be under the base bid. If this material cannot be processed on site for re-use, it shall be tracked in accordance with 01 21 00 against the 16,000 cy allowance. Both allowances 01 21 00, 2.02 and 02 21 00, 2.01 shall be part of the base bid for Filed Sub Bid Package F.

Item No. 6.76 Specification 31 51 00: Hayward Baker Inc is now an approved Rammed Aggregate Pier Installer complying with the requirements of 31 51 00, 1.03A.

Item No. 6.77 Specification 12 34 00: Question: Reference specification section 12 34 00 – 2.06: Loose Student Tables. Please verify the location and occurrence of these tables. For example, please refer to room C124 on drawing A1.14. Are these the loose student tables? Do the other labs have these student tables? How many are to be adjustable?
Answer: There are 10 Loose Student Lab Tables in C125 (per 12 34 00 2.06A) and 2 Adjustable Height Lab Tables (per 12 34 00 2.06B) in room C124. These are the tables shown on A1.14. This is the only location for these tables.

Item No. 6.78 Specification 01 40 00 – 1.02 insert the following under new subsection *D. Section 01 91 15 – Building Exterior Commissioning: Related field testing and commissioning requirements*.

Item No. 6.79 Specification 07 14 00 – 1.06 – B revise as stated: B. Repair and Replacement: Such defective work, and other work damaged thereby which becomes defective during the warranty term, without extra cost to the Owner. *Manufacturer option: Injection repairs meeting the performance level required of the systems specified and warranted by the manufacturer may be considered*.

Item No. 6.80 Specification 07 14 00 – 1.06 insert the following under new subsection *C. Access for repair: Warranty shall include all necessary removal of overburden, landscape and/or other similar work to allow access to systems for required repair/replacement. Upon completion of repair/replacement warranty shall include the reconstruction of all overburden, landscape and/or other similar work removed or disturbed to like new condition.*

Item No. 6.81 Specification 07 42 13 – 1.09 strike subsection "B" and replace with the following: *B. Manufacturer Warranty (Metal Wall Panel): Provide manufacturer's limited warranty covering degradation of metal wall panels and failure of factory-applied exterior finishes agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 30 year period from date of Substantial Completion.*

Item No. 6.82 Specification 07 42 13 – 1.09 insert the following new subsection: *C. Manufacturer Warranty (Phenolic Wall Panel): Provide manufacturer's limited warranty covering degradation of phenolic wall panels and failure of factory-applied exterior finishes agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 10 year period from date of Substantial Completion.*

Item No. 6.83 Specification 07 42 13 – 1.09 insert the following new subsection: *D. Installer's warranty of metal and phenolic wall panel systems, including agreement to repair or replace wall panels that fail within specified warranty period of two years from date of Substantial Completion.*

Item No. 6.84 Specification 07 53 00 – 1.09 – B revise subsection as stated: B. Manufacturer's System and Membrane Warranties: Upon completion of the membrane roofing system work, the roofing materials manufacturer shall furnish the Owner a "Total System" warranty insuring a watertight roof for a period of twenty-five (25) years. The warranty shall cover all repairs necessary over the twenty-five (25) year period up to the original cost of the original roofing contract. The membrane shall also be warranted not to prematurely deteriorate to the point of failure because of weathering for a period of twenty-five (25) years. Warranty shall include maximum peak gust wind speed coverage of up to ~~55~~ *72* mph.

Item No. 6.85 Specification 07 53 00 – 2.02 – C – 8 revise as stated: 8. Insulation Thermal Value R, *33 minimum. (6 inches minimum thickness).* ~~minimum: 33.6 6 inches minimum thickness.~~

Item No. 6.86 Specification 07 53 00 – 3.02 – A – 1 revised as stated: 1. Extend air-vapor barrier ~~under blocking to deck edge.~~ *over blocking to outside edge face of perimeter blocking. Unless otherwise indicated per the Drawings.*

Item No. 6.87 Specification 08 43 13 – 3.05 – B -1 revise as stated: 1. If any window fails~~, test additional windows. C~~ correct all leaking conditions. Replace*/Repair* windows that have failed field testing and retest until performance is satisfactory.

Item No. 6.88 Specification 08 51 13 – 2.02 – C – 1 – a revise as stated: a. Performance Class (PC): ~~R.~~ *CW.*

Item No. 6.89 Specification 08 51 13 – 2.02 – C – 1 – b revise as stated: b. Performance Grade (PG): ~~15~~ 30, with minimum design pressure (DP) of ~~15.04~~ *30* psf.

Item No. 6.90 Specification 08 51 13 – 3.04 – A revise as stated: A. Test *a minimum of (6) six* installed windows for water leakage in accordance with AAMA ~~501.2.~~ *502. Replace/Repair windows that have failed field testing and retest until performance is satisfactory. In addition, for each window unit that has failed, test an additional 2 adjacent window units at no additional cost to the Owner. Where adjacent units do not exist the Architect shall field select which additional units shall be tested.*

Item No. 6.91 Specification 08 51 13 – 3.04 insert the following new subsection: *B. Selection of window units to be tested shall be selected by Architect in the field. The contractor shall assume (3) three units will be at/near grade and (3) units will be selected from above grade floor levels.*

Item No. 6.92 Specification 08 62 23 Insert the following new subsection in its entirety:

3.04 FIELD QUALITY CONTROL

A. See Section 01 45 33 – Code Required Special Inspections: Owner testing of installed skylights.

B. See Section 01 91 15 – Building Exterior Commissioning: Related field testing and commissioning requirements.

Item No. 6.93 Reference Architectural Exterior Details Exterior details have been updated to clarify flashing and membrane locations, additional location of exterior sheathing and coordination of specification notations. Refer to the following attached revised drawings: A0.36, A0.48, A3.16, A3.31, A3.32, A3.33, A3.34, A3.35, A3.36, A3.37, A3.38, A3.40, A3.50, A3.51, A3.61, A3.62, A3.63, A3.64, A3.65.

Item No. 6.94 Reference Architectural Ceiling Plans Raise the ceiling height of student toilet rooms to 9'-0" AFF. See attached revised drawings: A1.50, A1.53, A1.54, A1.56, A1.57, A1.60, A1.63, A1.64, A1.66, A1.67.

No. 6.95 Reference Architectural Floor Plans, Drawing A4.30 Unless otherwise noted, detailed, or indicated to have intumescent paint, columns shall be enclosed with gypsum enclosures similar to details B4, E1 and G3 on A4.30 (depending on adjacent partition construction). Where columns are noted on the plans to have 05 58 13 column covers, refer to detail C7, C9 & C12 on A4.30 for additional information. These columns have 8" high 03 30 00 ARCHITECTURAL CONCRETE base. Refer to attached revised drawings A1.10 and A1.23 for additional 05 58 13 COLUMN COVER locations.

Item No. 6. 96 Reference A0.60 Add accessory 7D: 08 80 00 Full Length Frameless Mirror, surface mounted, see elevations for sizes.

Item No. 6.97 Reference Addenda Items 3.34 & 5.57: Both refer to 01 21 00 ALLOWANCES, as to how rock removal is to be paid. The only ledge allowance we can find is to carry the cost of 5,000 CY of ledge to be removed from site. We cannot find an allowance to be carried in the base bid for open and structural rock removal that is to remain on site. Is all drilling and blasting incidental to Subbid F? Please clarify.
Answer: Open and Structural Rock removal (including drilling and blasting of such) that is to remain on site shall be incidental and carried within the base bid for Filed Sub Bid Package F.

Item No. 6.98 Reference Addenda Item 5.60: Is the furnishing and installing of the flagpole to be carried in Filed Sub bid Package F?
Answer: Yes.

Item No. 6.99 Reference Plan S-2.0 - TYPICAL GEOTECHNICAL CONDITIONS refers to radon details on A-20.8. We could not find these details.
Answer: Refer to details Sheet R1.00 (instead of A-20.8) and Geotechnical Report.

Item No. 6.100 **Reference Drawing OS-3:** Offsite plans OS-3 of 12 shows two each solar-powered flashing lights on each side of Jagger Mill Rd. Would this be carried by the General Contractor, electrical subcontractor or earthwork subcontractor?
Answer: This shall be the responsibility of the Site Contractor as part of Filed Sub Bid Package F.

Item No. 6.101 **Reference Filed Sub Bid Package A**: Do the mason file sub-bidders supply their own reinforcing steel?
Answer: Filed Sub Bid Package A should include reinforcing in Masonry walls. The General Contractor shall verify all reinforcing is provided as part of the total Bid, particularly at locations where Masonry intersects foundations.

Item No. 6.102 **Reference Drawing E5.01**, Detail 7. Please identify where the two 'Dressing Rooms' are located. Also please confirm the panel designation P2N1H1 as it is not shown on the one-line.
Answer: Detail #7 on Drawing E5.01 is not applicable, Delete Detail.

Item No. 6.103 **Reference Drawing A0.2.02** Refer to revised detail C1/A0.2.02 and detail E1/A0.2.02 for clarification of top of wall conditions. Also refer to the UL listings provided in the project manual for specific construction requirements at each different UL listed wall type assembly as indicated.

Item No. 6.104 **Reference Drawing A7.11** Millwork at Pathway Libraries B120A, D120A and E120A have been modified to coordinate with counter-top devices issued in Addendum 5 electrical drawings. Refer to the attached revised drawing A7.11.

Item No. 6.105 **Reference Area B Door Schedule on A0.52, Elevation J4/A2.07** Door B052A, change frame type to 20 – HM frame with 08 91 00 Louver LV9 above.

Item No. 6.106 **Reference Specification 32 12 18** See attached further information on the Plexitrack Lightning Ployresin Track System from Plexipave.

Item No. 6.107 **Reference Specification 32 12 19** See attached further information on the Novacrylic Sports USA Combo Combination Surface System from Novacrylic.

Item No. 6.108 **Reference Electrical Drawings:** See updated Electrical Drawings reflecting changes.
Drawings E0.02, E0.03 and E2.41: Re-issued drawing indicating life-safety closets removed.
Drawing E5.01: Re-issued drawing with removal of "Dressing Room Detail".
Drawing E0.04: Re-issued Equipment Schedule with modifications to pumps HWP-1 & 2, and addition of CAF-2.

Item No. 6.109 **Reference Exterior Curtainwalls:** as a clarification for the curtain wall designs, the following wind pressures were calculated per ASCE 7-05 and can be utilized for the curtainwall design on the project. Note that interpolation is permitted between 20sf and 500 sf component areas:

Component 20 sf or less, direct pressure: 19.3 psf
Component 20 sf or less, interior zone suction: -21.4 psf
Component 20 sf or less, corner zone suction: -26.3 psf
Component 500 psf or greater, direct pressure: 14.8 psf
Component 500 psf or greater, interior zone suction: -16.4 psf

Component 500 psf or greater, corner zone suction: -16.4

Item No. 6.10 **Reference Specifications:** See Updated Specifications 23 92 50

Item No. 6.11 **Reference Specifications:** See Updated Specifications 23 73 00

Item No. 6.12 **Reference Specifications:** See Updated Specifications 23 97 50

Item No. 6.13 **Reference Specifications:** See Updated Specifications 26 14 00

Item No. 6.14 **Reference Drawings:** See Updated Drawings Attached.

END OF ADDENDA #6

SECTION 2-B-1

PROPOSAL FORM FOR GENERAL CONTRACTORS
(PUBLIC SCHOOL PROJECTS)

BIDDER:_____

_____

_____

TO: **Sanford School Department**
917 Main Street Suite 200
Sanford, Maine 04073

A. Having carefully examined the form of contract, general conditions, special provisions and plans and specifications dated **11 February 2016** Prepared by: **Lavallee Brensinger Architects**
For **Sanford High School and Technical Center, Sanford, Maine 04073 Project: 12-067-00, Dated: 11 February 2016, Issuance: Bid Documents**
as well as the premises and conditions affecting the work, we the undersigned propose to furnish all labor, equipment, and materials necessary for and reasonably incidental to the construction and completion of this proposal for the amount of:

_____Dollars

$_____

The above amount includes the allowances listed in Specification Section 01 21 00 – Allowances.

B. Alternate bids are included on this project. Refer to Section 01 23 00 – Alternates. Any dollar amount line below that is left blank by the Bidder shall be taken as a bid of $0.00. Alternate Bid prices are as follows:

Alternate No.	Title of Alternate	Dollar Amount
1	*Roof Protection Board*	
	ADD / DEDUCT (Circle One)	$ _____
2	*Concrete Brick at Rear Elevations*	
	ADD / DEDUCT (Circle One)	$ _____
3	*Concrete Brick at Front Elevations*	
	ADD / DEDUCT (Circle One)	$ _____
4	*Resilient Floor Tile and Ceramic Floor Tile*	
	ADD / DEDUCT (Circle One)	$ _____
5	*Porcelain Tile at Main Spine Area*	
	ADD / DEDUCT (Circle One)	$ _____

6 *Field Storage Building*

ADD / DEDUCT $ _____
(Circle One)

7 *Additional Fencing at Track*

ADD / DEDUCT $ _____
(Circle One)

8 *Organic Infill at Turf*

ADD / DEDUCT $ _____
(Circle One)

9 *Turf Custom Logo*

ADD / DEDUCT $ _____
(Circle One)

10 *Emergency Access Road Paving*

ADD / DEDUCT $ _____
(Circle One)

11 *Vinyl Fencing*

ADD / DEDUCT $ _____
(Circle One)

12 *Building Automation System / Controls Manufacturer*

ADD / DEDUCT $ _____
(Circle One)

13 *Stadium and Press Box Emergency Inverter*

ADD / DEDUCT $ _____
(Circle One)

14 *Metal Panel at Gym*

ADD / DEDUCT $ _____
(Circle One)

15 *Site Signs*

ADD / DEDUCT $ _____
(Circle One)

16 *Site Underdrain Reduction*

ADD / DEDUCT $ _____
(Circle One)

17 *Morin Brick at Rear Elevations*

ADD / DEDUCT $ _____
(Circle One)

18 *Morin Brick at Front Elevations*

ADD / DEDUCT $ _____
(Circle One)

C. The Bidder acknowledges receipt of the following addenda to the specifications and drawings:

Addendum No._____, Dated_____Addendum No._____, Dated_____

Addendum No._____, Dated_____Addendum No._____, Dated_____

Addendum No._____, Dated_____Addendum No._____, Dated_____

Addendum No._____, Dated_____Addendum No._____, Dated_____

D. Filed subcontract proposals as follows: (List those trades required, but do not combine trades except as called for)

Trade	Name of Subcontractor	Amount
Sub-Bid Package A	_____	$_____
Sub-Bid Package B	_____	$_____
Sub-Bid Package C	_____	$_____
Sub-Bid Package D	_____	$_____
Sub-Bid Package E	_____	$_____
Sub-Bid Package F	_____	$_____

The undersigned agrees that each of the above named subcontractors represents a bona fide SUBPROPOSAL based on the plans and specifications and will be used for the work indicated at the amount stated, unless a substitution is made by mutual agreement as provided for in section 1, paragraph 6, "Instructions to Bidders". In the event alternate prices are requested and various trades are involved, the general contractor may use properly filed subproposals even though a change in subcontractors from those carried in his base proposal may occur. If he does use different subcontractors because of alternates, he shall use supplemental sheets attached to the proposal form (2-B1) to indicate such changes.

E. The undersigned agrees, if this proposal is accepted, to sign a contract and deliver it, along with the bonds and affidavits of all insurance specified within twelve (12) calendar days after the date of notification of such acceptance, except if the 12th day falls on a holiday, a Saturday or Sunday, then the conditions will be fulfilled if the required documents are received before 12 o'clock noon on the day following the holiday, or the Monday following the Saturday or Sunday, and as a guarantee thereof, herewith submits a certified or cashier's check or bid bond as required.

The undersigned agrees, if awarded the contract, to complete the work on or before **August 1, 2018**.

This proposal includes the cost of a 100% performance bond and a 100% payment bond.

Signed _____

By _____

Address _____

_____

NOTE: If bidder is a corporation, write State of incorporation, and if a partnership, give full names of all partners.

END OF SECTION

2-B2
MAINE CONSTRUCTION BID DEPOSITORY
(PUBLIC SCHOOL PROJECTS)
PROPOSAL FORM FOR SUBCONTRACTORS
LONG FORM

To:_____

_____
For green envelope copy, list any general contractor(s) excluded from your bid.

PROJECT: **Sanford High School and Technical Center, Sanford, Maine 04073, Project: 12-067-00, Dated: 11 February 2016, Issuance: Bid Documents**
SECTION(S) QUOTED:_____
PRICE QUOTED: SECTION_____$_____SECTION_____$_____
TOTAL COMBINED PRICE (if applicable) SECTIONS_____$_____

A. The undersigned propose to furnish all labor and materials required for completing in accordance with the hereinafter described plans, specifications general conditions and addenda, all the work specified in the above stated section(s) of the specifications and contract drawings dated **11 February 2016**.
Prepared by **Lavallee Brensinger Architects**.

B. Alternate bids are included on this project. Refer to Section 01 23 00 – Alternates. Any dollar amount line below that is left blank by the Bidder shall be taken as a bid of $0.00. Alternate Bid prices are as follows: (Use separate sheets as necessary)

Alternate No.	Title of Alternate	Dollar Amount
1	*Roof Protection Board*	
	ADD / DEDUCT (Circle One)	$ _____
2	*Concrete Brick at Rear Elevations*	
	ADD / DEDUCT (Circle One)	$ _____
3	*Concrete Brick at Front Elevations*	
	ADD / DEDUCT (Circle One)	$ _____
4	*Resilient Floor Tile and Ceramic Floor Tile*	
	ADD / DEDUCT (Circle One)	$ _____
5	*Porcelain Tile at Main Spine Area*	
	ADD / DEDUCT (Circle One)	$ _____
6	*Field Storage Building*	
	ADD / DEDUCT (Circle One)	$ _____
7	*Additional Fencing at Track*	
	ADD / DEDUCT (Circle One)	$ _____

8 *Organic Infill at Turf*

ADD / DEDUCT $ _____
(Circle One)

9 *Turf Custom Logo*

ADD / DEDUCT $ _____
(Circle One)

10 *Emergency Access Road Paving*

ADD / DEDUCT $ _____
(Circle One)

11 *Vinyl Fencing*

ADD / DEDUCT $ _____
(Circle One)

12 *Building Automation System / Controls Manufacturer*

ADD / DEDUCT $ _____
(Circle One)

13 *Stadium and Press Box Emergency Inverter*

ADD / DEDUCT $ _____
(Circle One)

14 *Metal Panel at Gym*

ADD / DEDUCT $ _____
(Circle One)

15 *Site Signs*

ADD / DEDUCT $ _____
(Circle One)

16 *Site Underdrain Reduction*

ADD / DEDUCT $ _____
(Circle One)

17 *Morin Brick at Rear Elevations*

ADD / DEDUCT $ _____
(Circle One)

18 *Morin Brick at Front Elevations*

ADD / DEDUCT $ _____
(Circle One)

C. The subcontract proposal includes the following addenda to the drawings and specifications: (List addenda and issue date of each).

Addendum No._____, Dated_____Addendum No._____, Dated_____

Addendum No._____, Dated_____Addendum No._____, Dated_____

Addendum No._____, Dated_____Addendum No._____, Dated_____

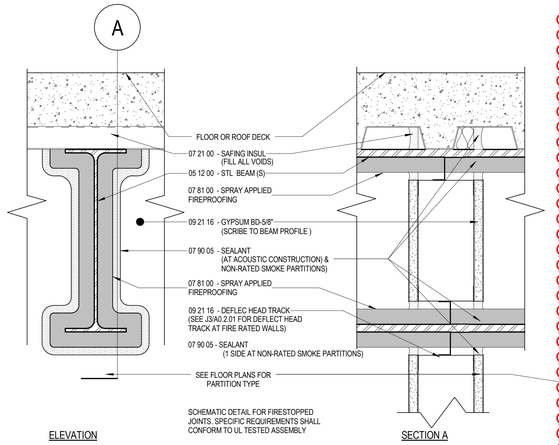
Addendum No._____, Dated_____Addendum No._____, Dated_____

D. The undersigned agrees that, if he is selected as a subcontractor, he will execute with the selected general contractor a subcontract in accordance with the terms of this subproposal, and furnish the general contract with a 100% performance bond and a 100% payment bond <u>for his portion of the work.</u>

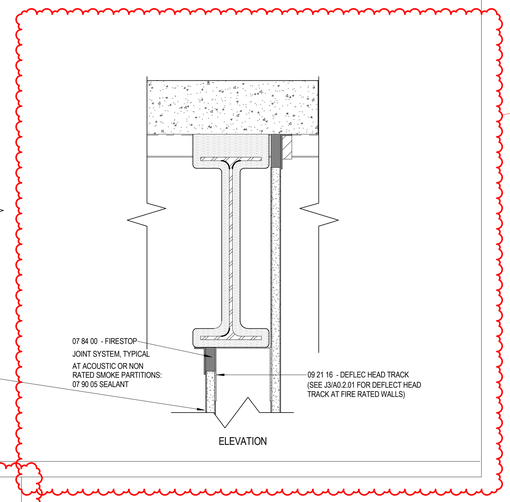
E. _____License # (if applicable)_____
(Firm Name of Sub-bidder)
Signed by:_____Date_____
Address_____
Street City State Zip

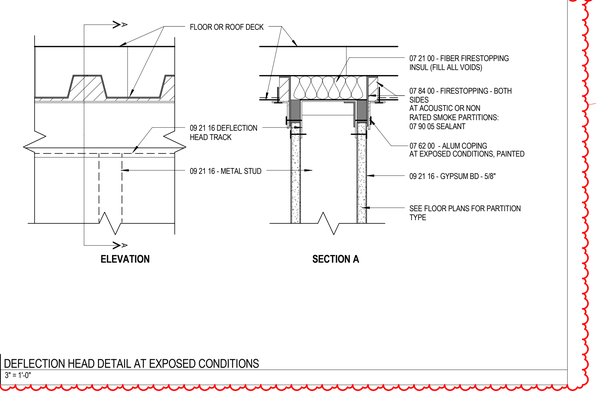
F. All foreign corporations intending to do business in Maine must comply with the provisions of 13A M.R.S.A., Chapter 12 and shall contact the Secretary of State for compliance.

END OF SECTION



C1 A0.2.02 — FIRESTOPPING-SEALANT DTL at BEAMPARTITION
3" = 1'-0"





E1 A0.2.02 — DEFLECTION HEAD DETAIL AT EXPOSED CONDITIONS
3" = 1'-0"

GRAPHICS LEGEND

OCCUPANCY CLASSIFICATION

- USE GROUP E
- USE GROUP A-1
- USE GROUP A-2
- USE GROUP A-3
- USE GROUP A-4
- USE GROUP B
- USE GROUP S-1
- INCIDENTIAL ACCESSORY OCCUPANCY
- DOUBLE HEIGHT SPACE

PROPOSED FIRE RATED CONSTRUCTION

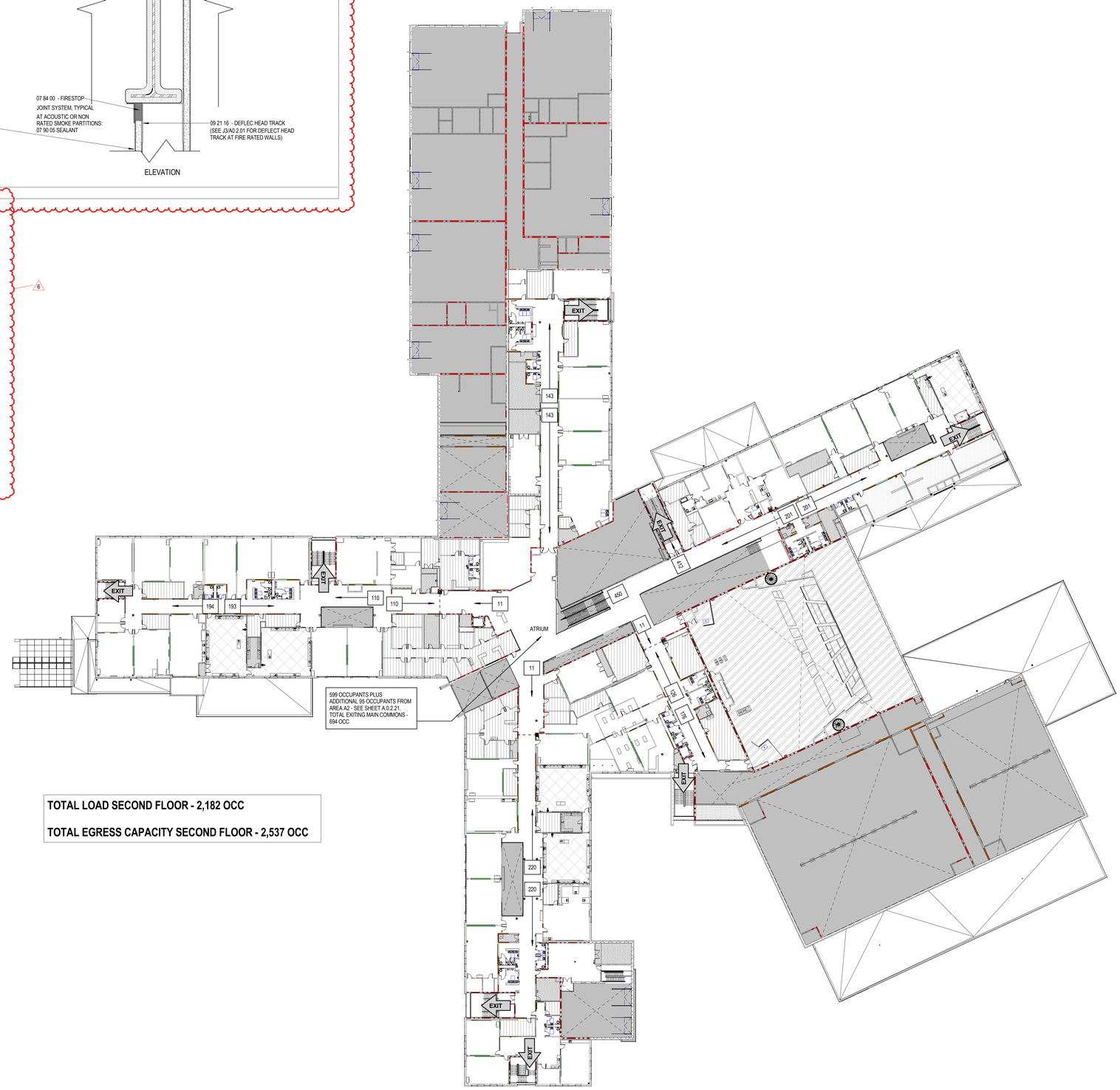
- NON-RATED SMOKE PARTITION
- 1 HR FIRE BARRIER
- 2 HR FIRE BARRIER
- 3 HR FIRE WALL
- ATRIUM — 1 HR ATRIUM ENCLOSURE

MEANS OF EGRESS

- R: XXX — REQUIRED EGRESS CAPACITY
- P: XXX — PROVIDED EGRESS CAPACITY
- EXIT — EXIT
- EXIT ACCESS
- FEC — FIRE EXTINGUISHER CABINET
- FE — WALL MOUNTED FIRE EXTINGUISHER

NOTE: PER DISCUSSION WITH AHJ, FIRE EXTINGUISHERS LAYOUT IS PER NFPA 10. START POINT @ EXITS SHALL INCLUDE AN EXTINGUISHER 25'-0" OR LESS, THEN 75'-0" O.C. (MAX) THEREAFTER.

Graphic Scale: 1 inch = 32 feet
0 32' 64' 96' 128'



TOTAL LOAD SECOND FLOOR - 2,182 OCC

TOTAL EGRESS CAPACITY SECOND FLOOR - 2,537 OCC

J5 A0.2.02 — CODE PLAN SECOND FLOOR - OVERALL
1/32" = 1'-0"

LAVALLEE BRENSINGER ARCHITECTS
Boston | Manchester | Portland
155 Dow Street, Suite 400, Manchester, NH 03101
603.622.5450
305 Commercial Street, Portland, ME 04101
207.558.7200
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Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16

CONTENT: CODE ANALYSIS TEXT, SYMBOLS AND RATINGS - SECOND FLOOR

DRAWN BY:	CSG
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A0.2.02

Project Phase
BID DOCUMENTS

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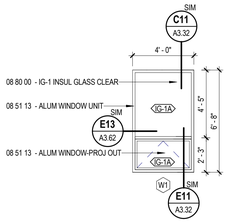
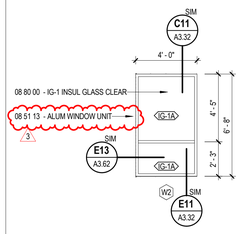
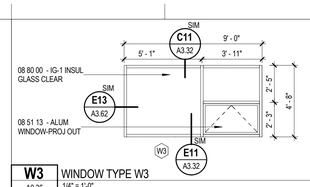
3/24/2016 12:24:58 PM C:\Projects\12-067-00_Sanford Tech Central_v16_casey.gerken.rvt



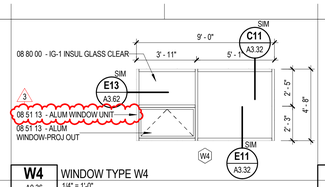
W1 A0.36 WINDOW TYPE W1
1/4" = 1'-0"



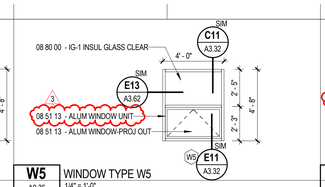
W2 A0.36 WINDOW TYPE W2
1/4" = 1'-0"



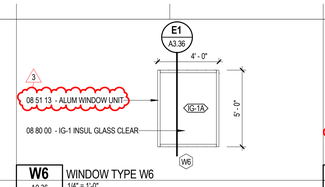
W3 A0.36 WINDOW TYPE W3
1/4" = 1'-0"



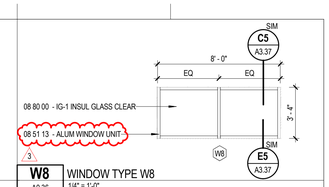
W4 A0.36 WINDOW TYPE W4
1/4" = 1'-0"



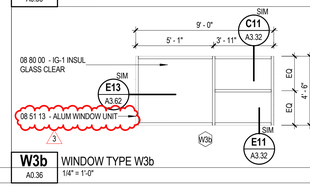
W5 A0.36 WINDOW TYPE W5
1/4" = 1'-0"



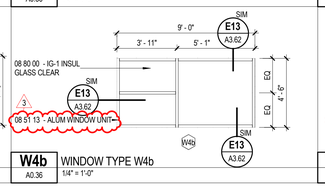
W6 A0.36 WINDOW TYPE W6
1/4" = 1'-0"



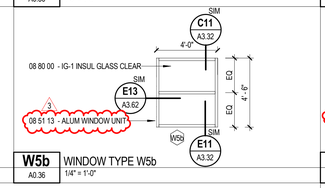
W8 A0.36 WINDOW TYPE W8
1/4" = 1'-0"



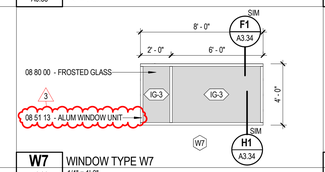
W3b A0.36 WINDOW TYPE W3b
1/4" = 1'-0"



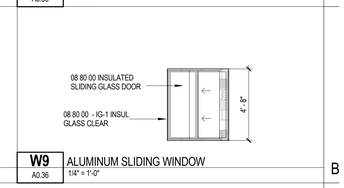
W4b A0.36 WINDOW TYPE W4b
1/4" = 1'-0"



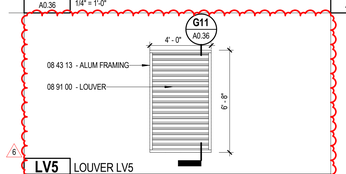
W5b A0.36 WINDOW TYPE W5b
1/4" = 1'-0"



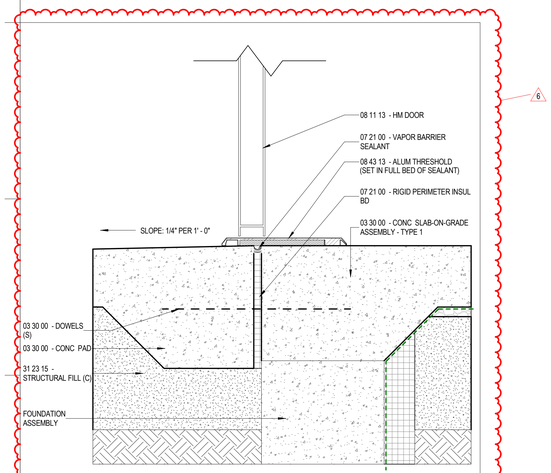
W7 A0.36 WINDOW TYPE W7
1/4" = 1'-0"



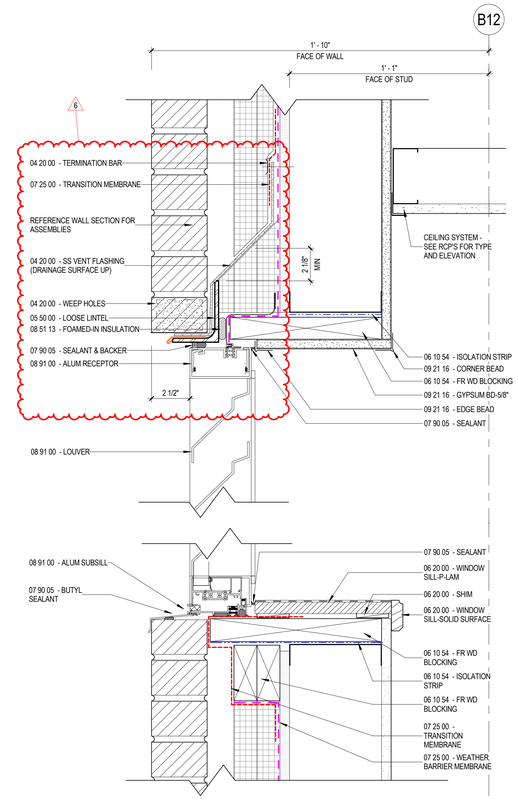
W9 A0.36 ALUMINUM SLIDING WINDOW
1/4" = 1'-0"



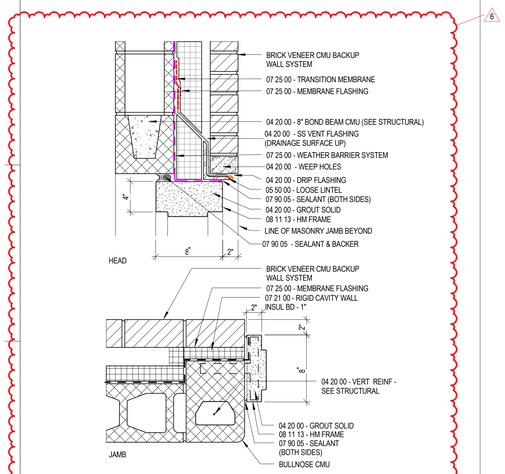
LV5 A0.36 LOUVER LV5
1/4" = 1'-0"



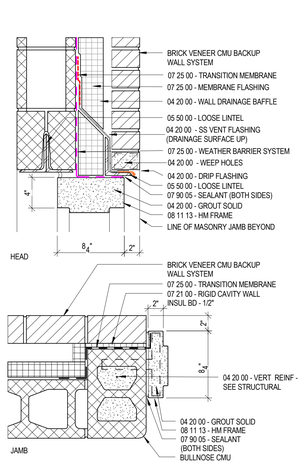
G1 A0.36 A0.36_G1_HM FRAME SILL@ EXTERIOR
3" = 1'-0"



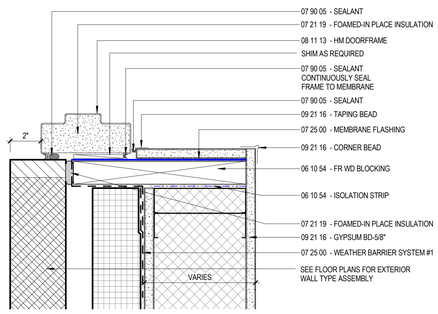
G11 A0.36 HM LOUVER FRAME/HEAD & SILL @ BRICK VENEER CMU BACKUP
3" = 1'-0"



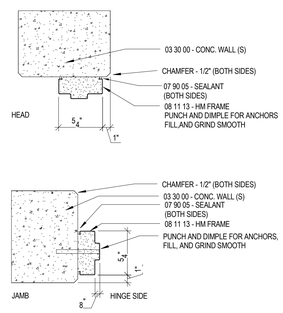
J1 A0.36 HM FRAME/HEAD & JAMB @ BRICK VENEER CMU BACKUP
1 1/2" = 1'-0"



J4 A0.36 HM FRAME/HEAD & JAMB @ BRICK VENEER/CMU w/ LINTEL
1 1/2" = 1'-0"



j7 A0.36 TYP. EXTERIOR HM FRAME TYPE 2 JAMB DETAIL AT BRICK ON TOP 9 DARK BLOCK ON BOTTOM
3" = 1'-0"



J10 A0.36 HM FRAME/HEAD & JAMB @ CONCRETE WALL
1 1/2" = 1'-0"

GLAZING SCHEDULE

- IG-1 08 80 00 - INSUL GLASS
- IG-1A 08 80 00 - INSUL GLASS - (TYPICAL UNLESS NOTED)
- IG-2 08 80 00 - INSUL GLASS - SPANDREL
- IG-3 08 80 00 - INSUL GLASS - FROSTED
- IG-3 08 80 00 - INSUL GLASS - FROSTED IN FRONT OF MASONRY BACKUP
- IG-4 08 80 00 - INSUL GLASS - OPAQUE PANELS 3
- IG-5 08 80 00 - 1 (G-1A) INSUL GLASS & 05 50 00 - PERFORATED METAL - TYPE 2

S-1	08 80 00 - SINGLE VISION GLAZING
S-2	08 80 00 - FIRE-RATED SAFETY GLAZING
S-3	08 80 00 - LAMINATED SAFETY GLAZING
S-4	08 80 00 - DOUBLE GLAZED VISION, STC 40
S-5	08 80 00 - LAMINATED SPANDREL GLASS
S-6	08 80 00 - ONE WAY MIRROR GLASS
S-7	08 80 00 - MIRROR GLASS
S-8	08 80 00 - SLIDING GLASS DOOR PANELS
S-9	08 80 00 - GLASS SHELVES
S-10	08 80 00 - TEMPERED GLAZING
A	08 80 00 - PLASTIC FILM TYPE A
B	08 80 00 - PLASTIC FILM TYPE B
C	08 80 00 - PLASTIC FILM TYPE C

NOTE: FILM SHALL BE INSTALLED ON ROOM SIDE

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Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
3	Addendum 3	03/04/16
6	Addendum 6	03/24/16

CONTENT:
EXTERIOR - WINDOW FRAME TYPES, WINDOW & DOOR DETAILS

DRAWN BY: CLU
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: As indicated

A0.36

Project Phase
BID DOCUMENTS

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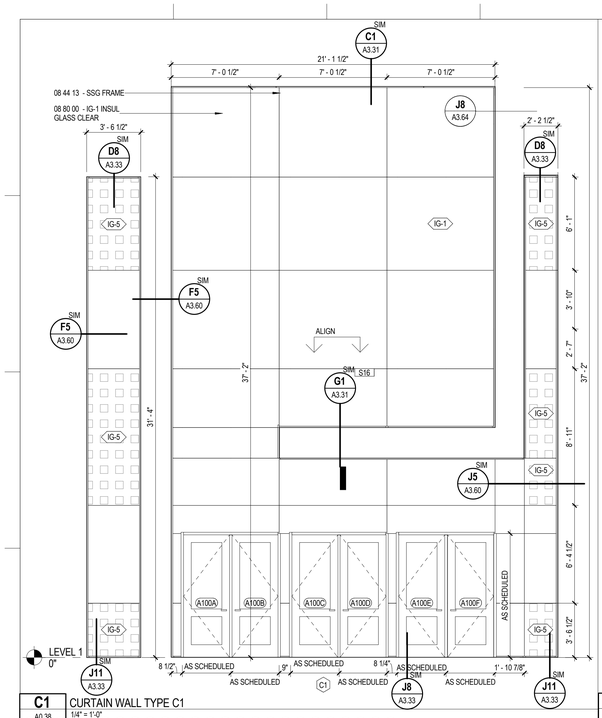
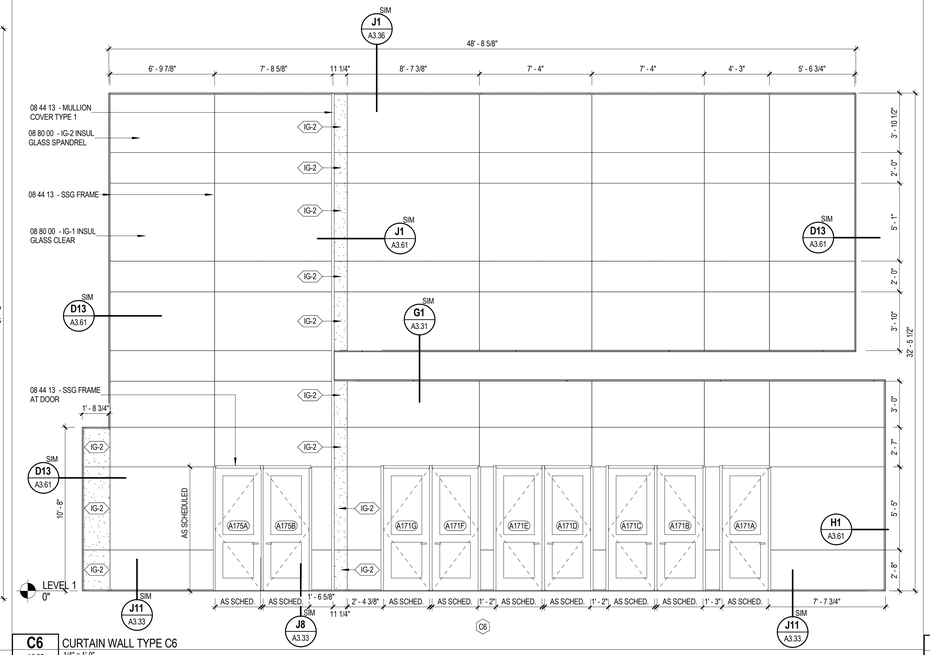
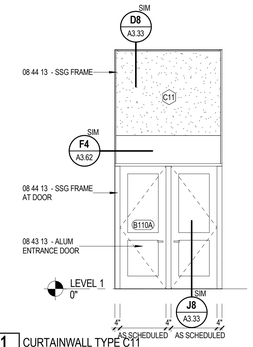


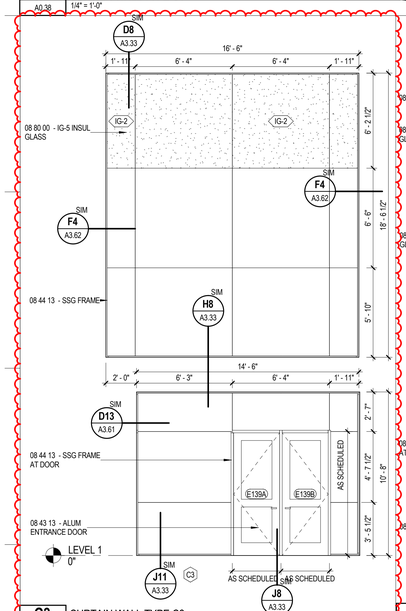
C1 CURTAIN WALL TYPE C1
A0.38 1/4" = 1'-0"



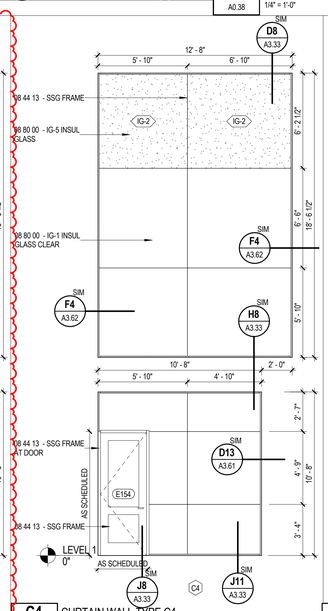
C6 CURTAIN WALL TYPE C6
A0.38 1/4" = 1'-0"



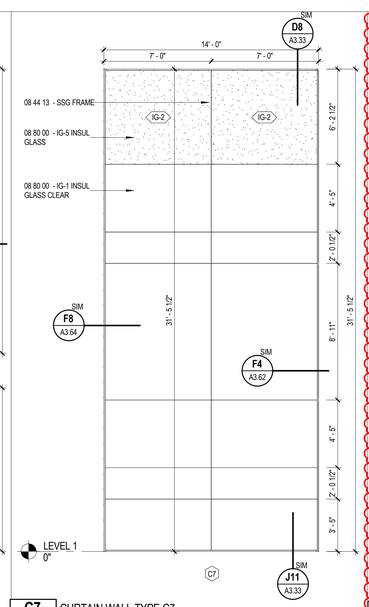
C11 CURTAINWALL TYPE C11
A0.38 1/4" = 1'-0"



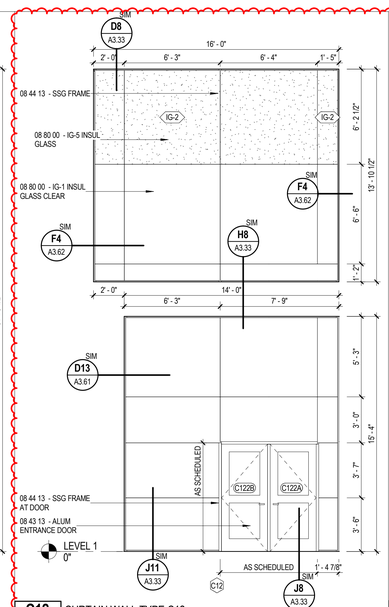
C3 CURTAIN WALL TYPE C3
A0.38 1/4" = 1'-0"



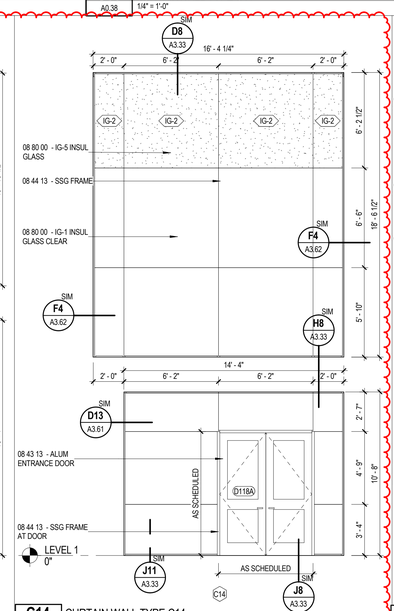
C4 CURTAIN WALL TYPE C4
A0.38 1/4" = 1'-0"



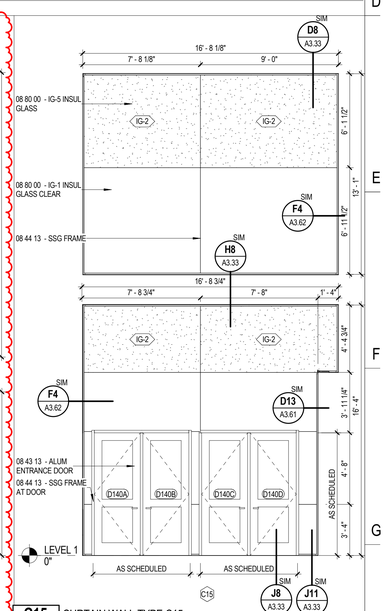
C7 CURTAIN WALL TYPE C7
A0.38 1/4" = 1'-0"



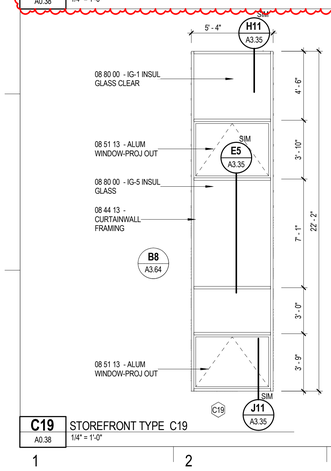
C12 CURTAIN WALL TYPE C12
A0.38 1/4" = 1'-0"



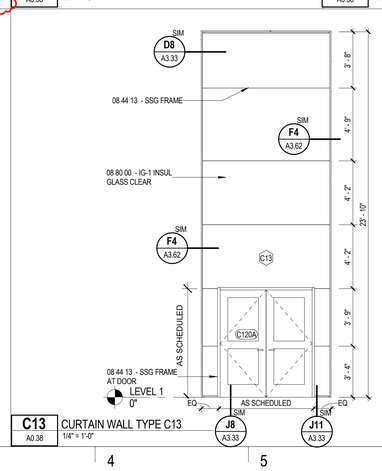
C14 CURTAIN WALL TYPE C14
A0.38 1/4" = 1'-0"



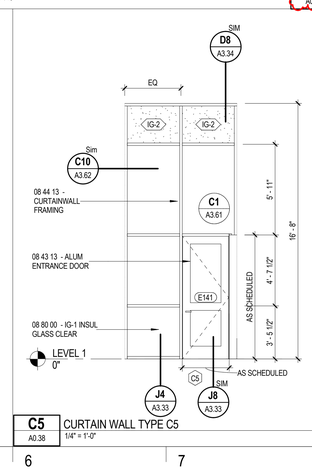
C15 CURTAIN WALL TYPE C15
A0.38 1/4" = 1'-0"



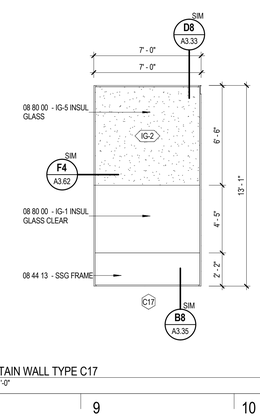
C19 STOREFRONT TYPE C19
A0.38 1/4" = 1'-0"



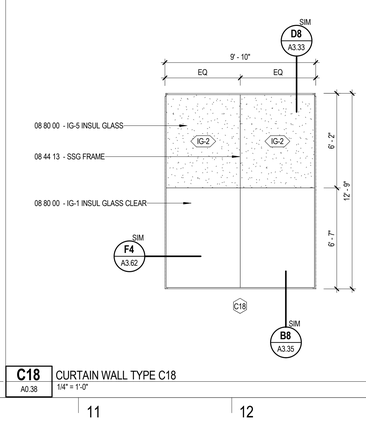
C13 CURTAIN WALL TYPE C13
A0.38 1/4" = 1'-0"



C5 CURTAIN WALL TYPE C5
A0.38 1/4" = 1'-0"



C17 CURTAIN WALL TYPE C17
A0.38 1/4" = 1'-0"



C18 CURTAIN WALL TYPE C18
A0.38 1/4" = 1'-0"

GLAZING SCHEDULE

IG-1	08 80 00 - INSUL GLASS
IG-1A	08 80 00 - INSUL GLASS - (TYPICAL UNLESS NOTED)
IG-2	08 80 00 - INSUL GLASS - SPANDREL
IG-3	08 80 00 - INSUL GLASS - FROSTED
IG-3	08 80 00 - INSUL GLASS - FROSTED IN FRONT OF MASONRY BACKUP
IG-4	08 80 00 - ~~IG-1A INSUL GLASS & 08 80 00 - PERFORATED METAL - TYPE 1~~
IG-5	08 80 00 - IG-1A INSUL GLASS & 08 80 00 - PERFORATED METAL - TYPE 2

S-1	08 80 00 - SINGLE VISION GLAZING
S-2	08 80 00 - FIRE-RATED SAFETY GLAZING
S-3	08 80 00 - LAMINATED SAFETY GLAZING
S-4	08 80 00 - DOUBLE GLAZED VISION, STC 40
S-5	08 80 00 - LAMINATED SPANDREL GLASS
S-6	08 80 00 - ONE WAY MIRROR GLASS
S-7	08 80 00 - MIRROR GLASS
S-8	08 80 00 - SLIDING GLASS DOOR PANELS
S-9	08 80 00 - GLASS SHELVES
S-10	08 80 00 - TEMPERED GLAZING
A	08 80 00 - PLASTIC FILM TYPE A
B	08 80 00 - PLASTIC FILM TYPE B
C	08 80 00 - PLASTIC FILM TYPE C

NOTE: FILM SHALL BE INSTALLED ON ROOM SIDE

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SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16

CONTENT:
EXTERIOR - CURTAIN WALL TYPES

DRAWN BY:	CLU
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/4" = 1'-0"

A0.38

Project Phase
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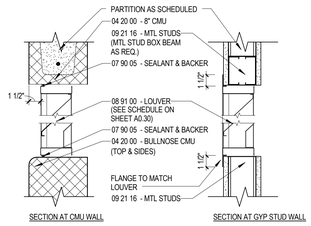
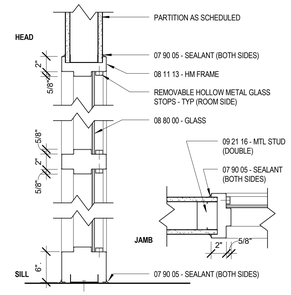
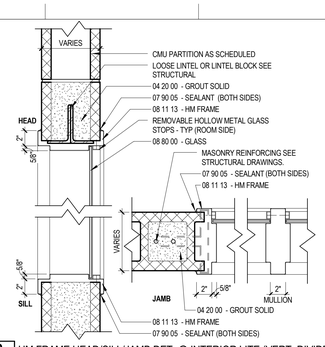


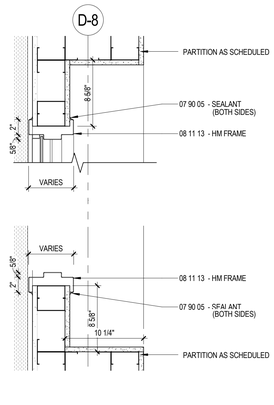
B7 A0.48 LOUVER FRAME DETAILS
1 1/2" = 1'-0"



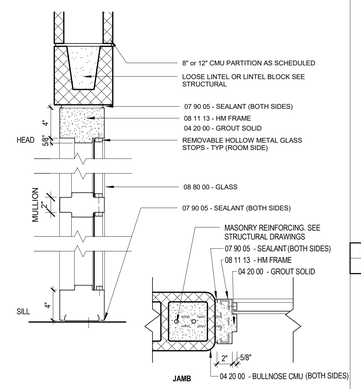
B10 A0.48 HM FRAME/HEAD, SILL, & JAMB @ SIDELITE
1 1/2" = 1'-0"



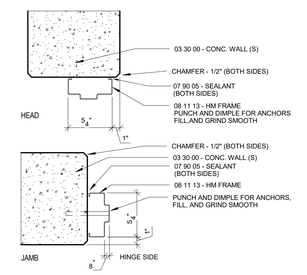
B12 A0.48 HM FRAME HEAD/SILL/JAMB DET. @ INTERIOR LITE (VERT. DIVIDER) (CMU)
1 1/2" = 1'-0"



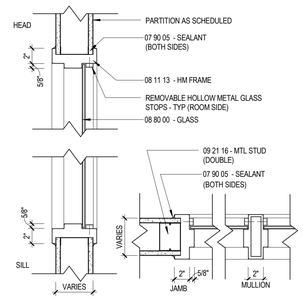
E4 A0.48 HM JAMB DETAIL @ S47 WALL PARTITION
1 1/2" = 1'-0"



E7 A0.48 HM FRAME/HEAD, SILL, & JAMB @ SIDELITE (8" & 12" CMU)
1 1/2" = 1'-0"



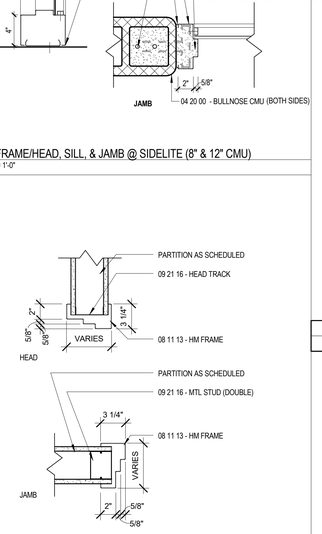
D10 A0.48 HM FRAME/HEAD & JAMB @ CONCRETE WALL
1 1/2" = 1'-0"



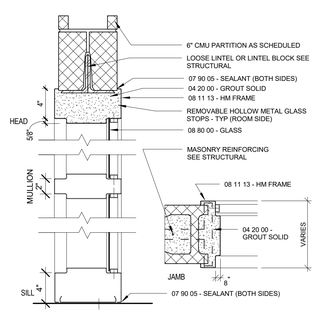
D12 A0.48 HM FRAME HEAD/SILL/JAMB DETAILS @ INTERIOR LITE (VERT. DIVIDER)
1 1/2" = 1'-0"

SEE DETAIL J1/A3.06

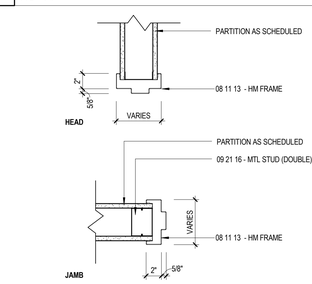
H4 A0.48 HM FRAME/HEAD & JAMB @ BRICK VENEER CMU BACKUP1
1 1/2" = 1'-0"



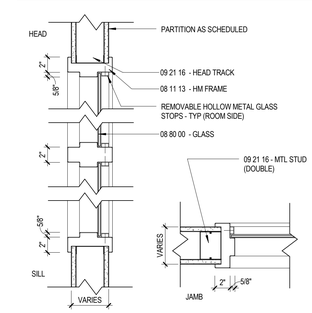
H7 A0.48 HM FRAME (DOUBLE EGRESS) HEAD & JAMB @ MTL STUD PARTITION
1 1/2" = 1'-0"



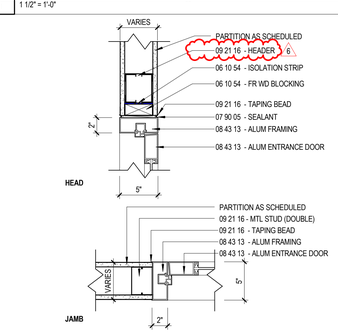
F10 A0.48 HM FRAME/HEAD, SILL, & JAMB @ SIDELITE (4" & 6" CMU)
1 1/2" = 1'-0"



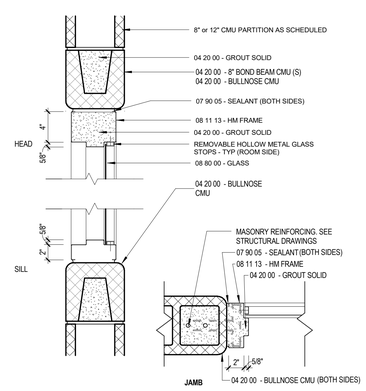
F12 A0.48 HM FRAME HEAD & JAMB DETAILS @ METAL STUD PARTITION
1 1/2" = 1'-0"



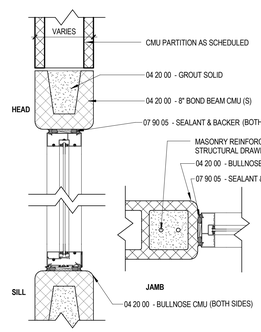
H10 A0.48 HM FRAME HEAD/SILL/JAMB DET. @ INTERIOR LITE (HORZ. DIVIDER)
1 1/2" = 1'-0"



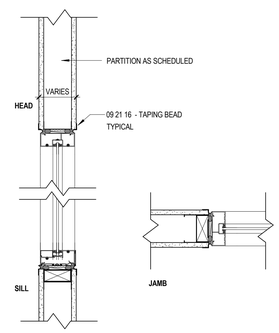
H12 A0.48 ALUM FRAME, HEAD & JAMB DETAIL @ METAL STUD PARTITION
1 1/2" = 1'-0"



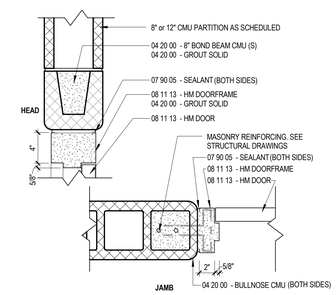
J2 A0.48 HM FRAME/HEAD, SILL, & JAMB (8" & 12" CMU)
1 1/2" = 1'-0"



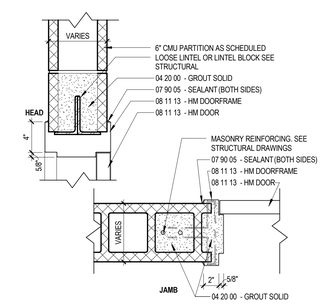
J4 A0.48 ALUMINUM FRAME HEAD/SILL/JAMB DET. @ INTERIOR LITE (VERT. DIVIDER) (CMU)
1 1/2" = 1'-0"



J7 A0.48 ALUMINUM STOREFRONT TO GYP - HEAD DETAIL
1 1/2" = 1'-0"



J10 A0.48 HM FRAME HEAD & JAMB DETAILS @ 8" & 12" CMU PARTITION
1 1/2" = 1'-0"



J12 A0.48 HM FRAME HEAD & JAMB DETAILS @ 6" CMU PARTITION
1 1/2" = 1'-0"

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NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16

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CONTENT:
INTERIOR - DOOR, WINDOW & FRAME TYPE DETAILS

DRAWN BY: SRG
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: 1 1/2" = 1'-0"

A0.48

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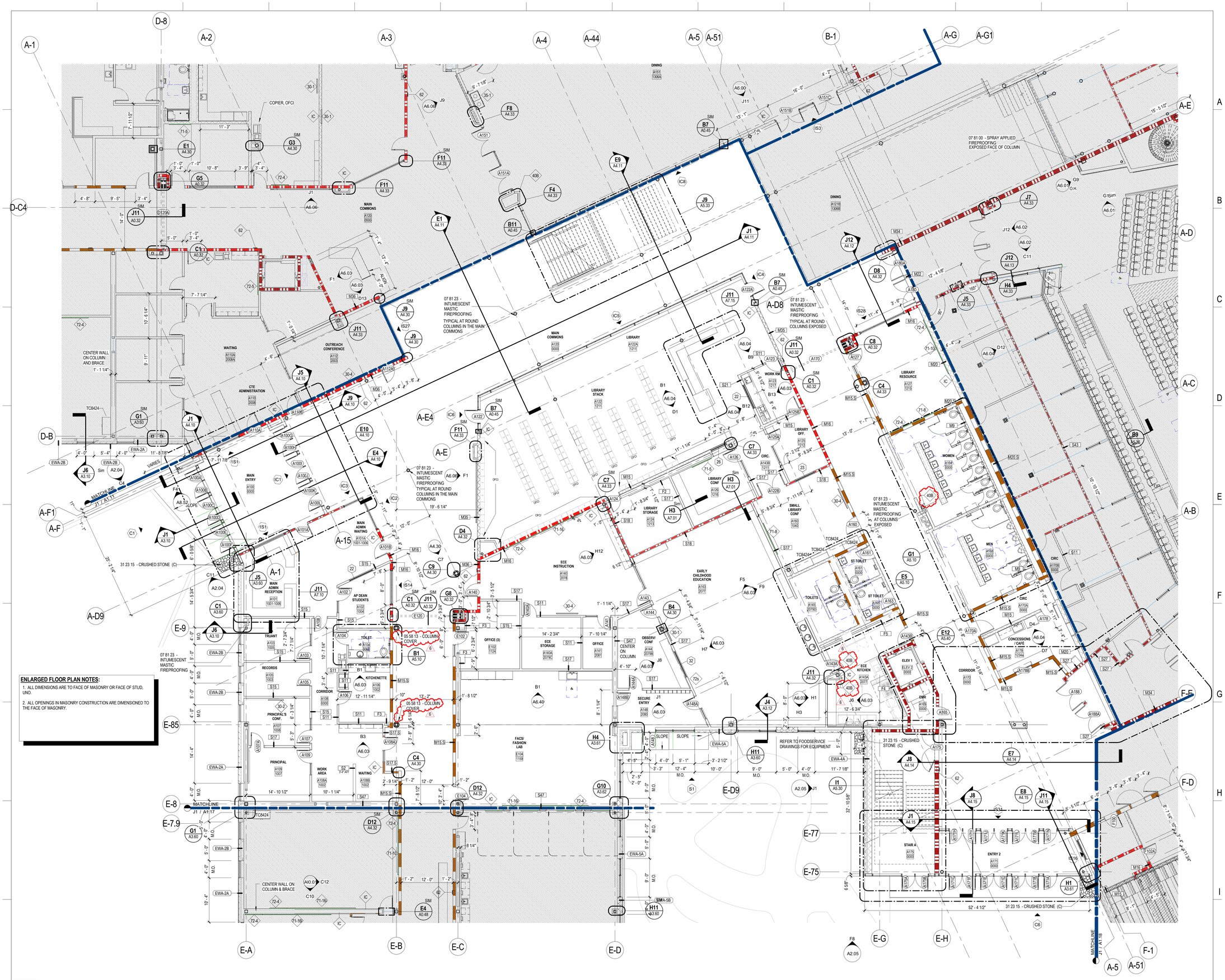

ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.

J1 A1.10 LEVEL 1 - AREA A1
1/8" = 1'-0"

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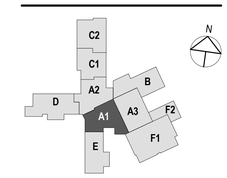
NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16



CONTENT:
FIRST FLOOR PLAN - AREA A1

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.10

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2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.

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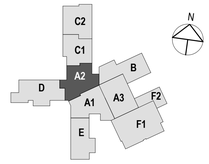
NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16



CONTENT:

FIRST FLOOR PLAN - AREA A2

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.11

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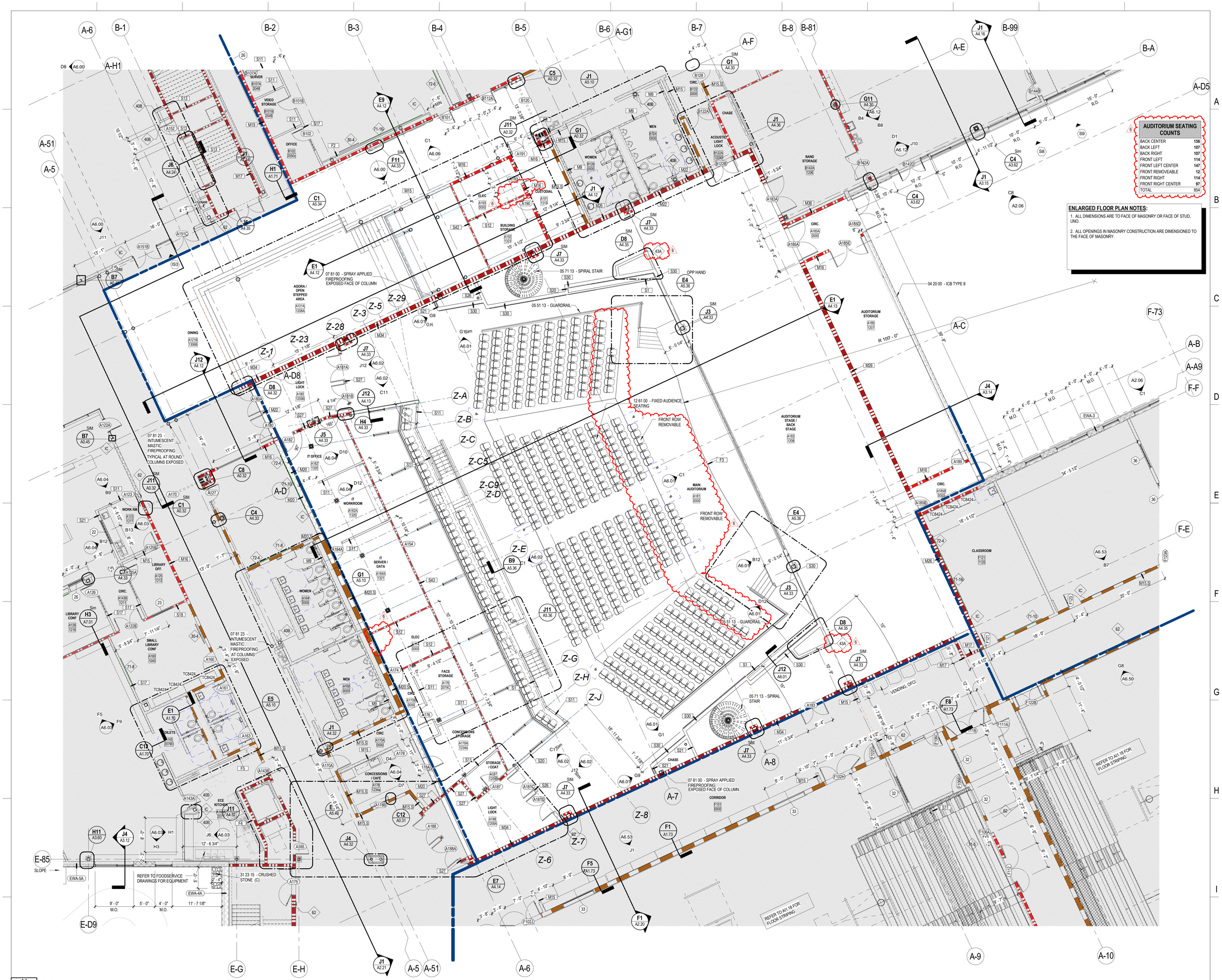

AUDITORIUM SEATING COUNTS	
BACK CENTER	156
BACK LEFT	107
BACK RIGHT	107
FRONT LEFT	114
FRONT LEFT CENTER	147
FRONT REMOVEABLE	12
FRONT RIGHT	114
FRONT RIGHT CENTER	97
TOTAL	854

ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.

J1 A1.12 LEVEL 1 - AREA A3
1/8" = 1'-0"

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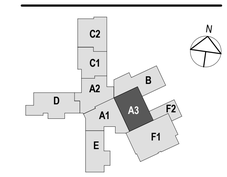
NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16



CONTENT:
FIRST FLOOR PLAN - AREA A3

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.12

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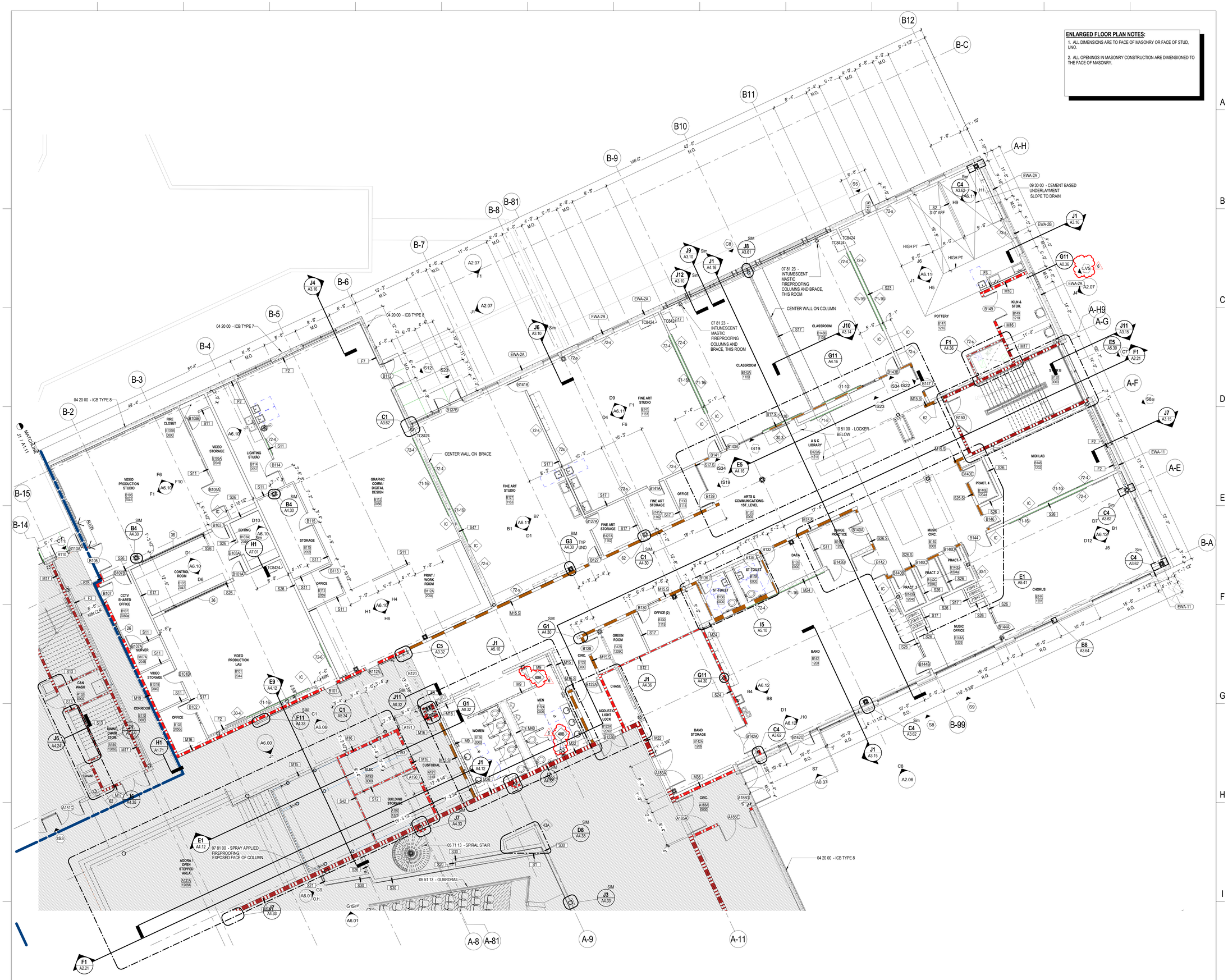
1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.



J1 LEVEL 1 - AREA B
A1.13 1/8" = 1'-0"

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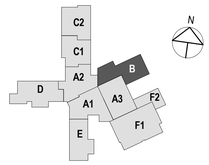
NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16



CONTENT:
FIRST FLOOR PLAN - AREA B

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.13

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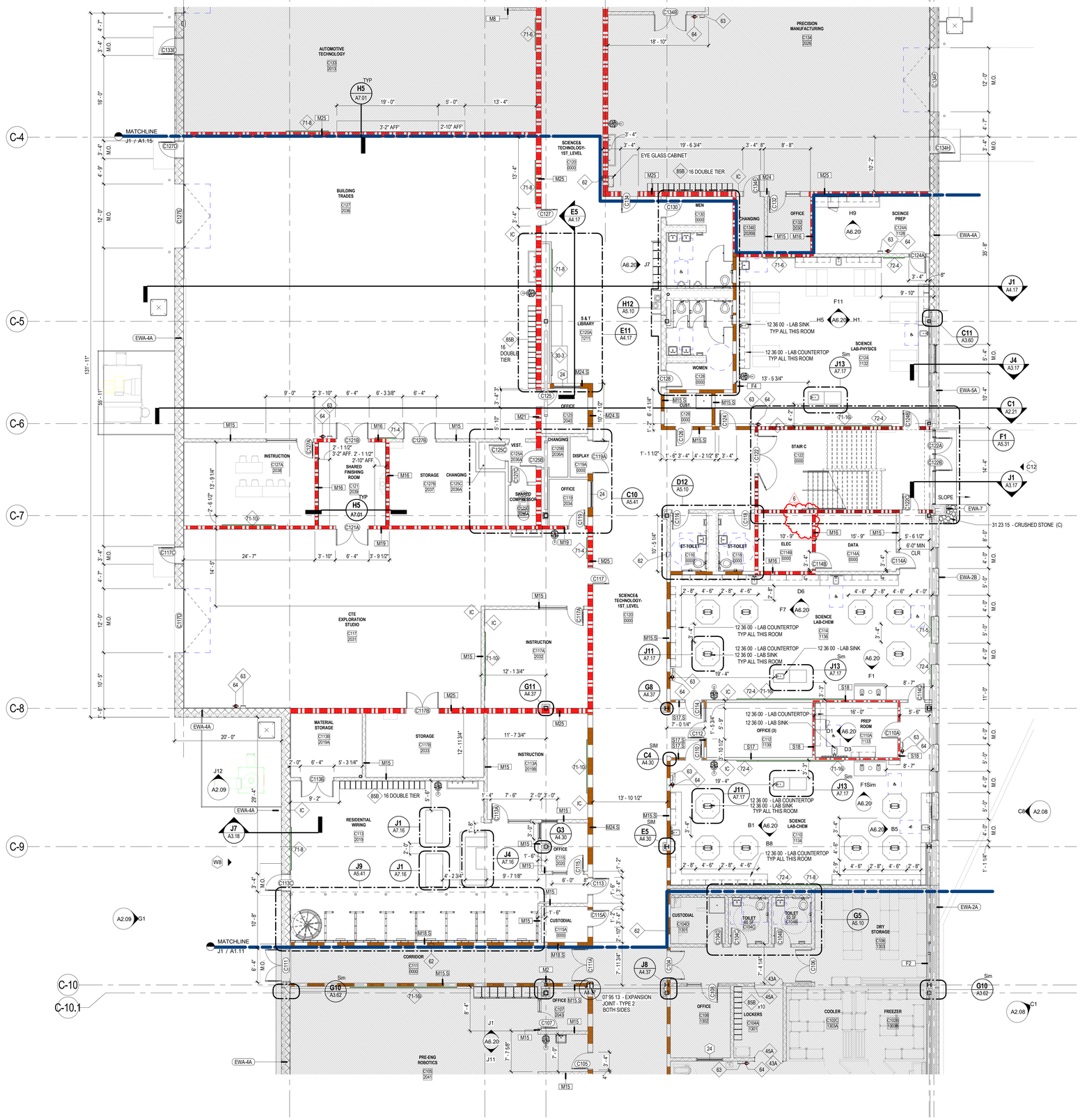
1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.



J1 LEVEL 1 - AREA C1
A1.14 1/8" = 1'-0"

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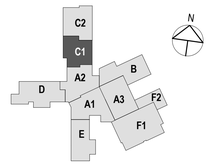
6	Addendum 6	03/24/16



CONTENT:
FIRST FLOOR PLAN - AREA C1

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
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SCALE:	As indicated

A1.14

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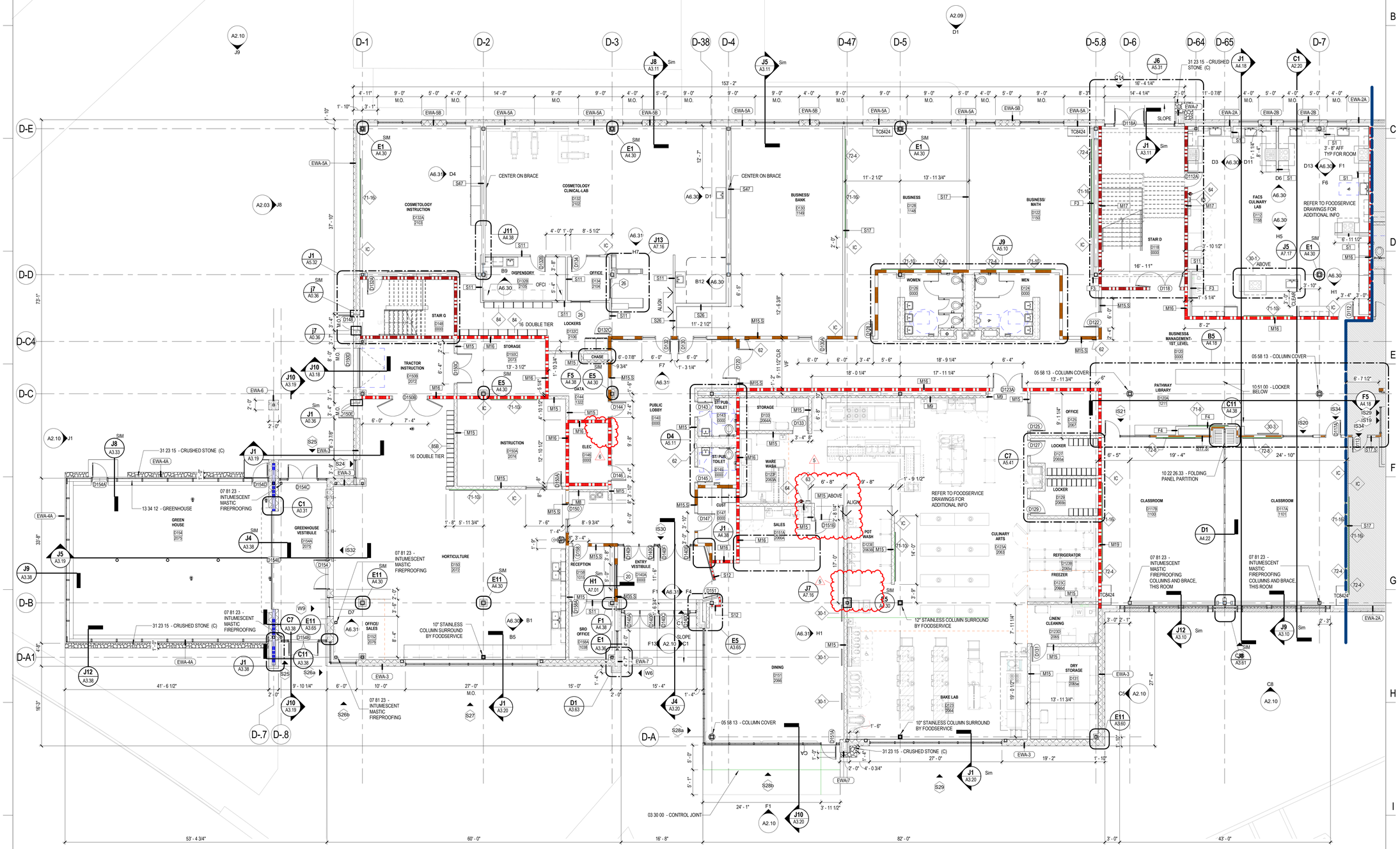
1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.



J1 A1.16 LEVEL 1 - AREA D
1/8" = 1'-0"

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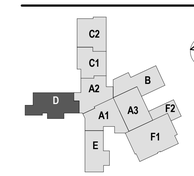
NO.	DESCRIPTION	DATE
5	Addendum 5	03/17/16
6	Addendum 6	03/24/16



CONTENT:
FIRST FLOOR PLAN - AREA D

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.16

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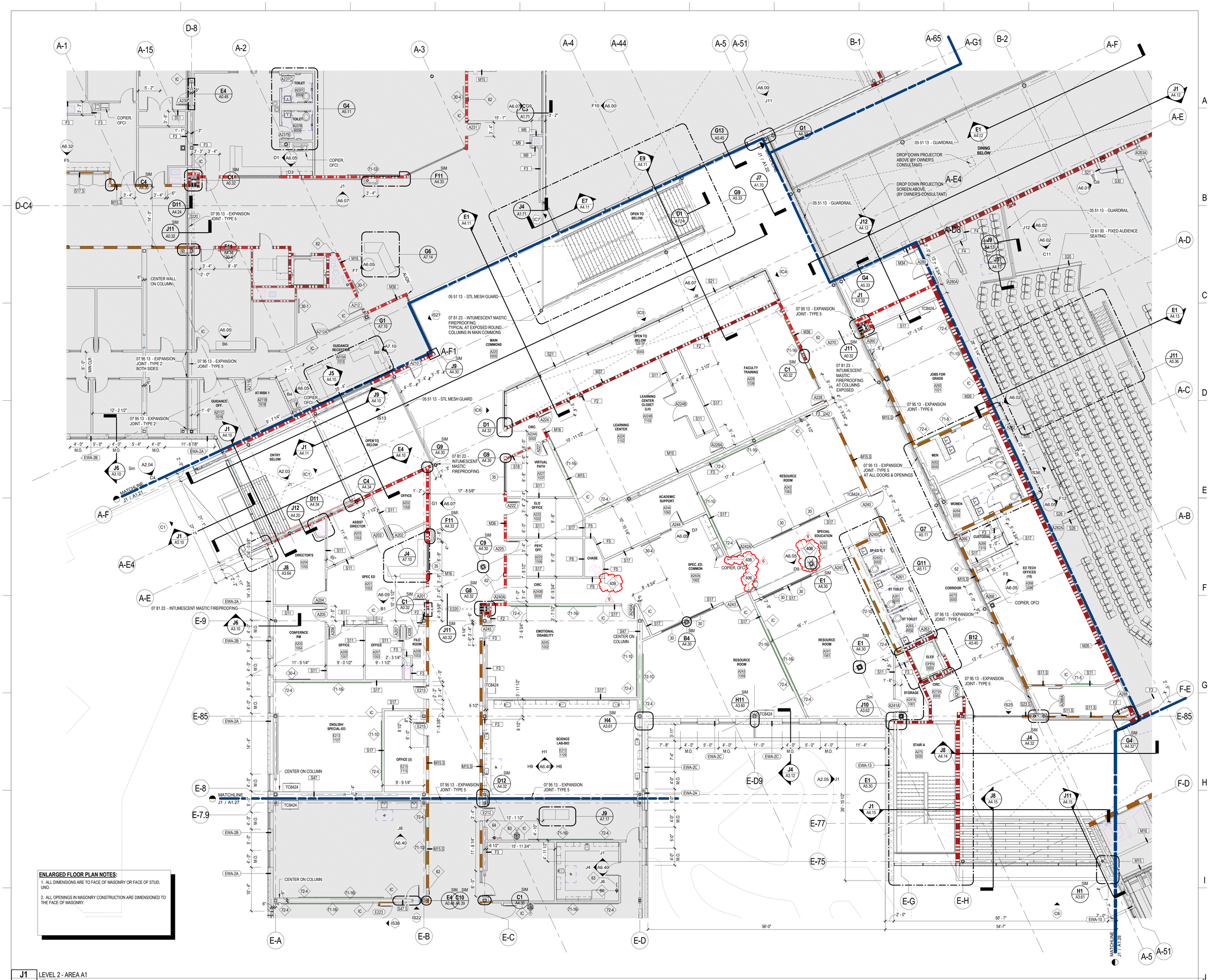

ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.

J1 A1.20 — LEVEL 2 - AREA A1
1/8" = 1'-0"

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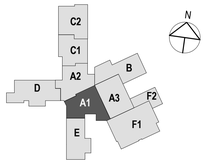
NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR PLAN - AREA A1

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.20

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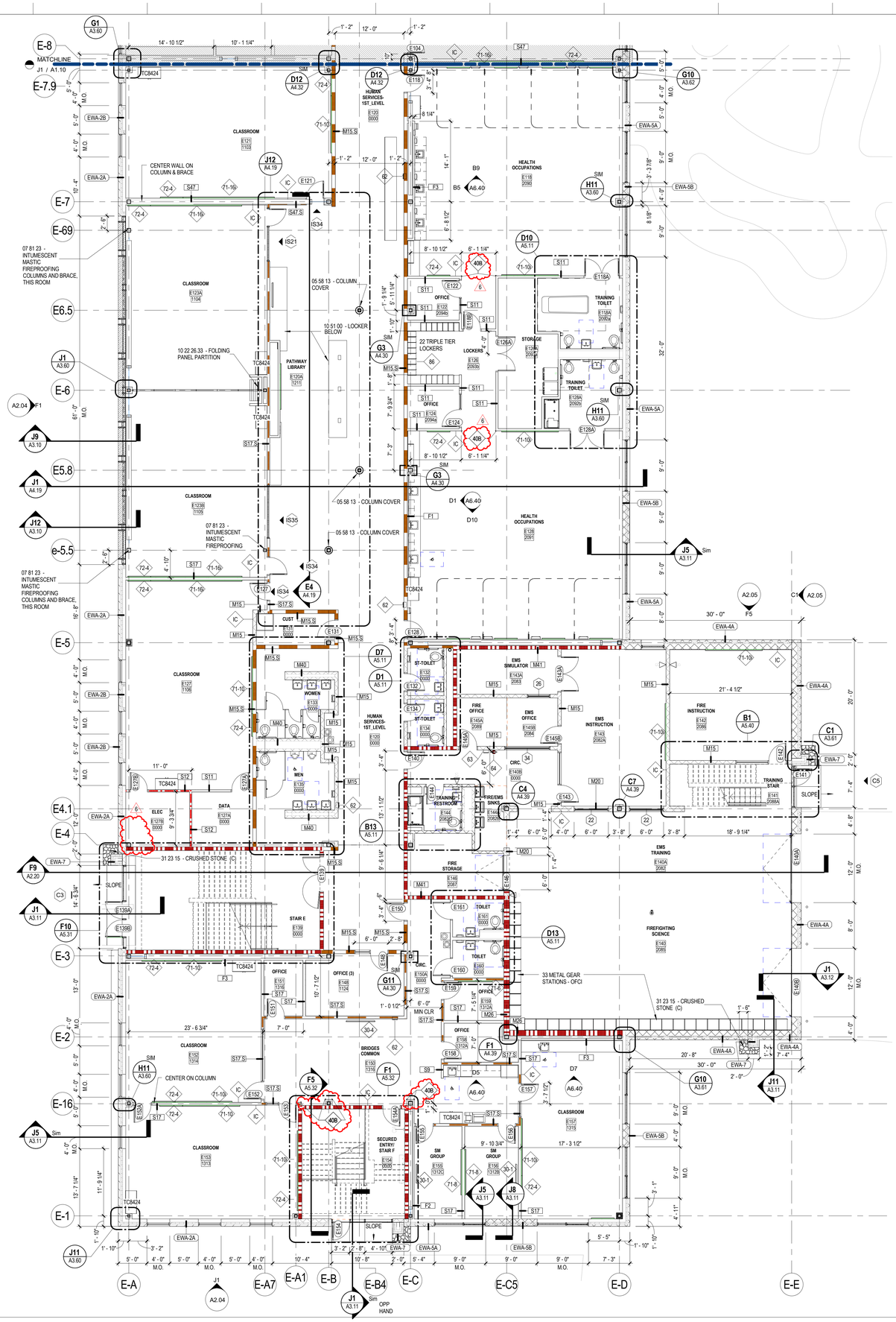

J1 A1.17 LEVEL 1 - AREA E
1/8" = 1'-0"

ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.

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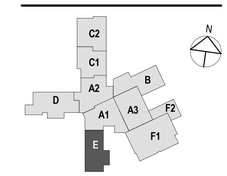
6	Addendum 6	03/24/16



CONTENT: FIRST FLOOR PLAN - AREA E

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.17

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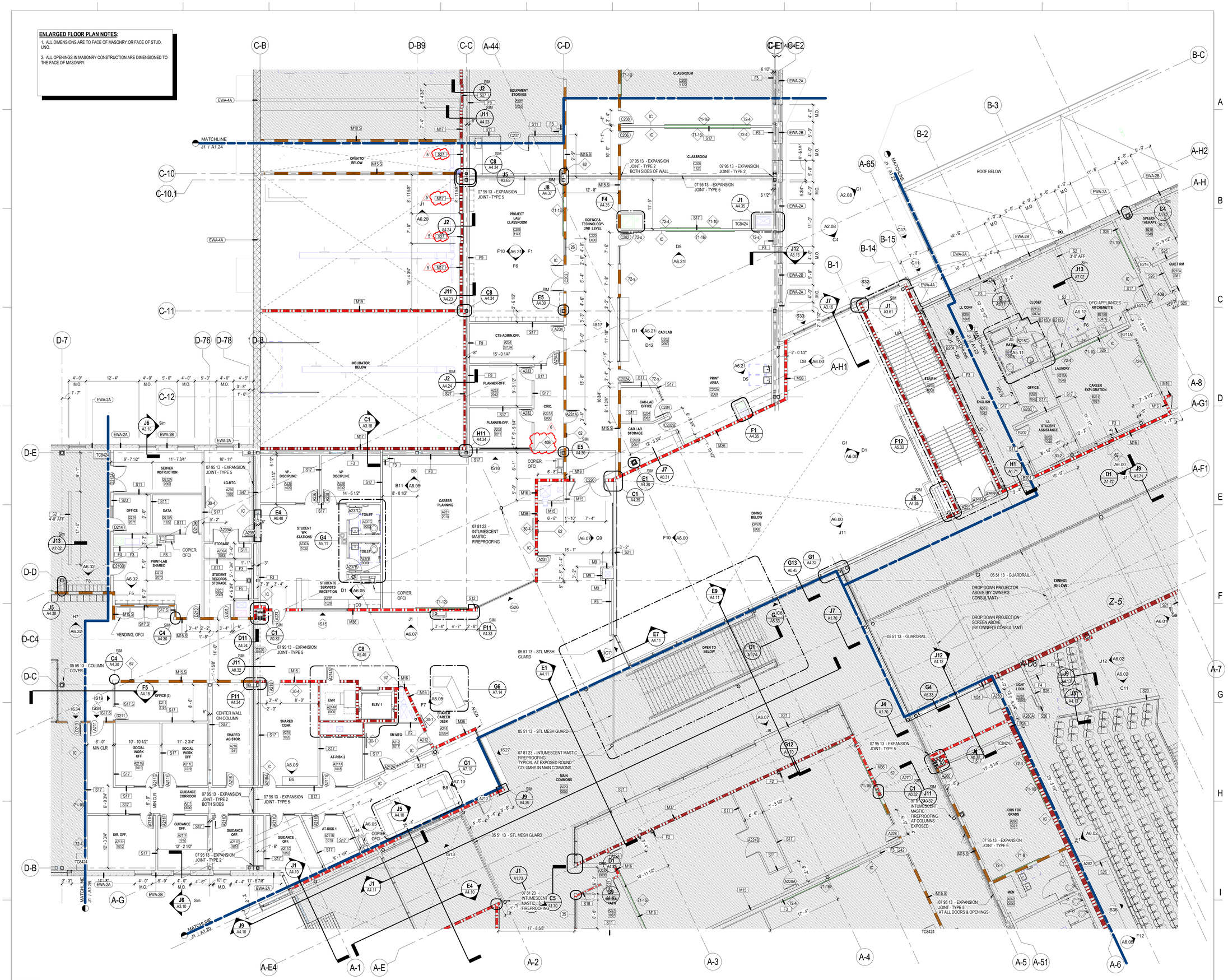
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.



J1 LEVEL 2 - AREA A2
A1.21 1/8" = 1'-0"

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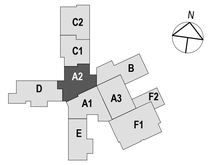
5	Addendum 5	03/17/16
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR PLAN - AREA A2

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.21

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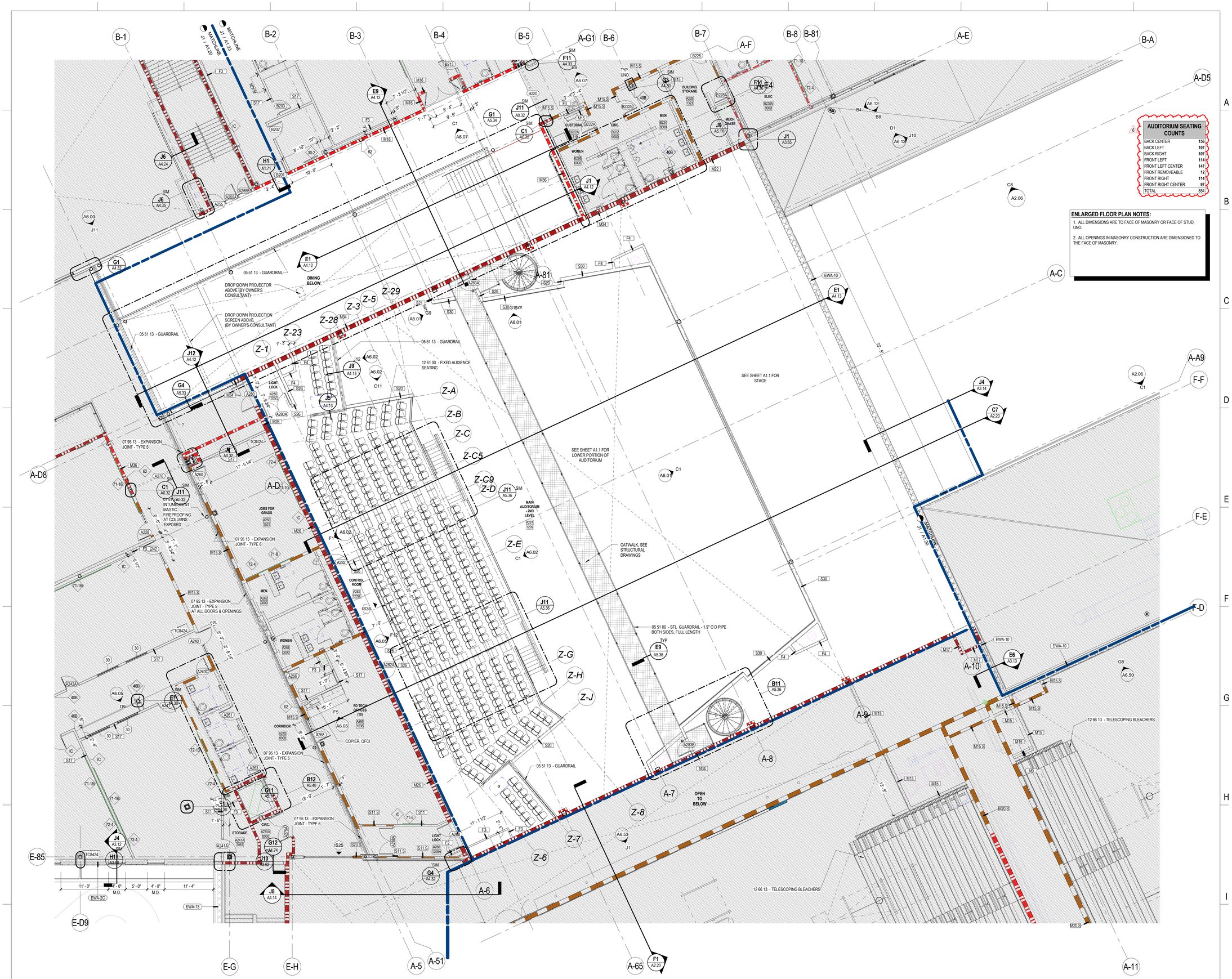

J1 LEVEL 2 - AREA A3
A1.22 1/8" = 1'-0"

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6	Addendum 6	03/24/16

CONTENT:
SECOND FLOOR PLAN - AREA A3

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
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SCALE:	As indicated

A1.22

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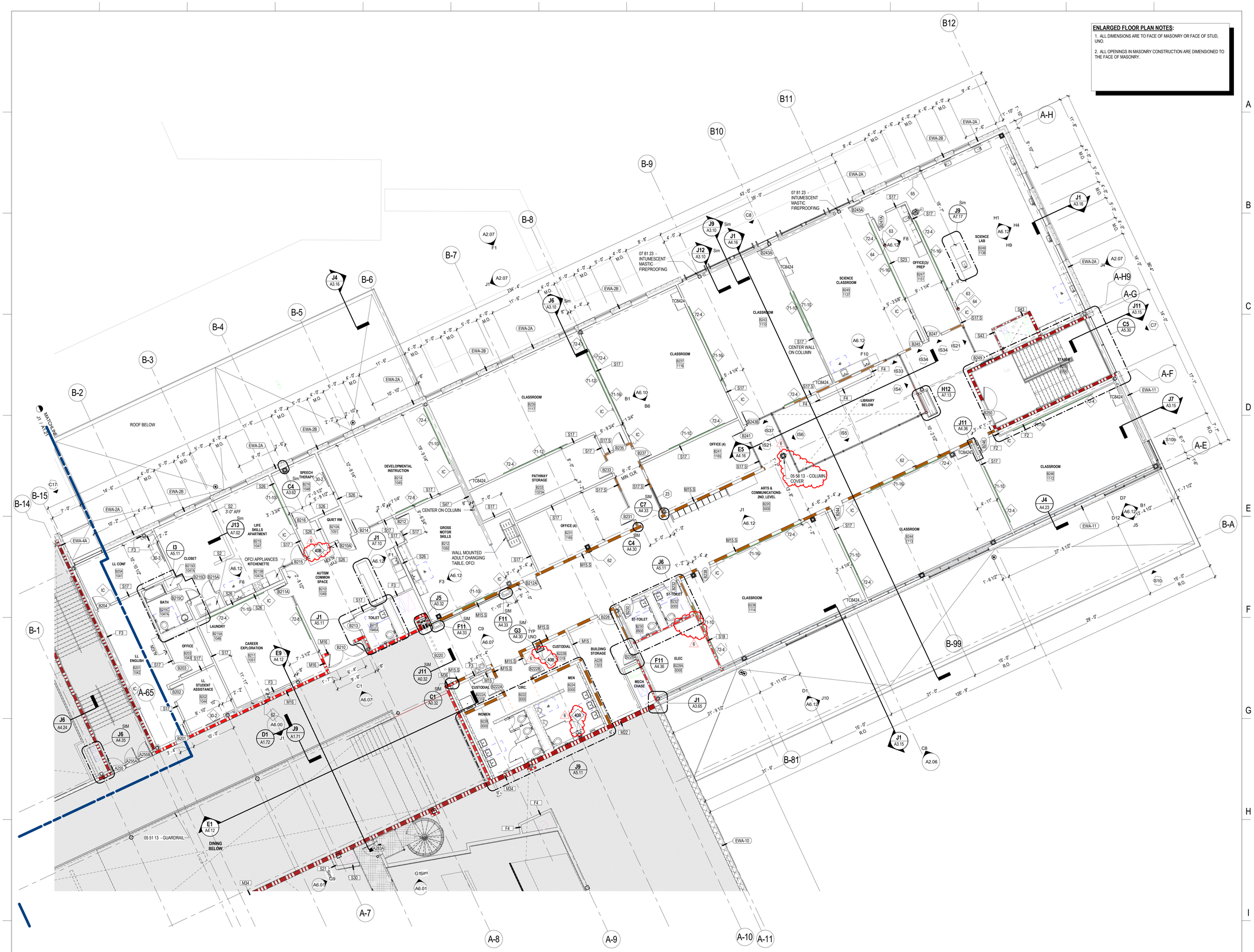
ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.



J1 A1.23 LEVEL 2 - AREA B
1/8" = 1'-0"

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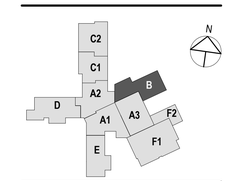
SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR PLAN - AREA B

DRAWN BY:	JMS
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.23

Project Phase
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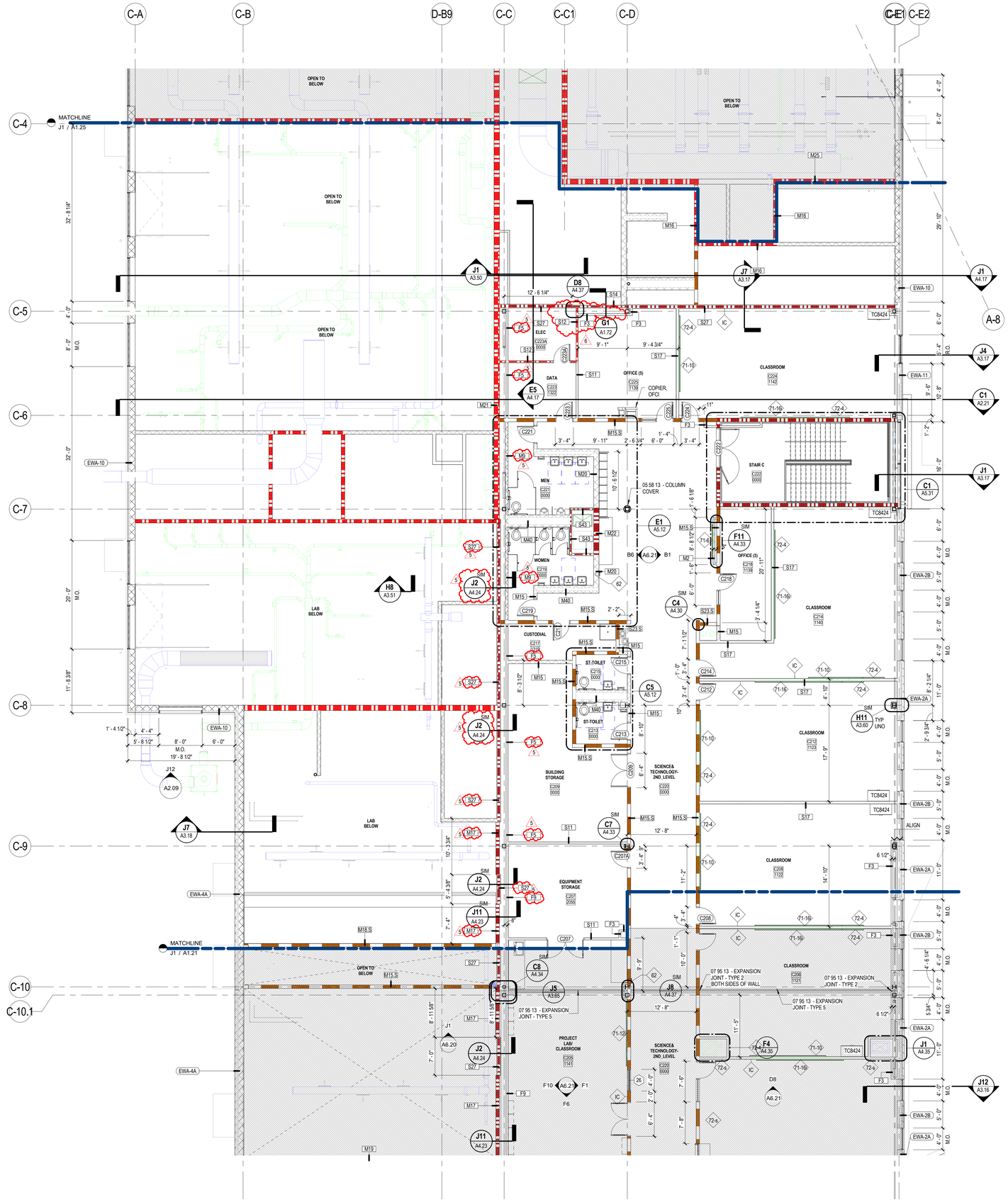

ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.

J1 LEVEL 2 - AREA C1
A1.24 1/8" = 1'-0"

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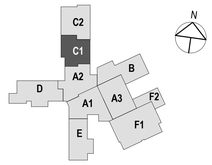
NO.	DESCRIPTION	DATE
5	Addendum 5	03/17/16
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR PLAN - AREA C1

DRAWN BY: JMS
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: As indicated

A1.24

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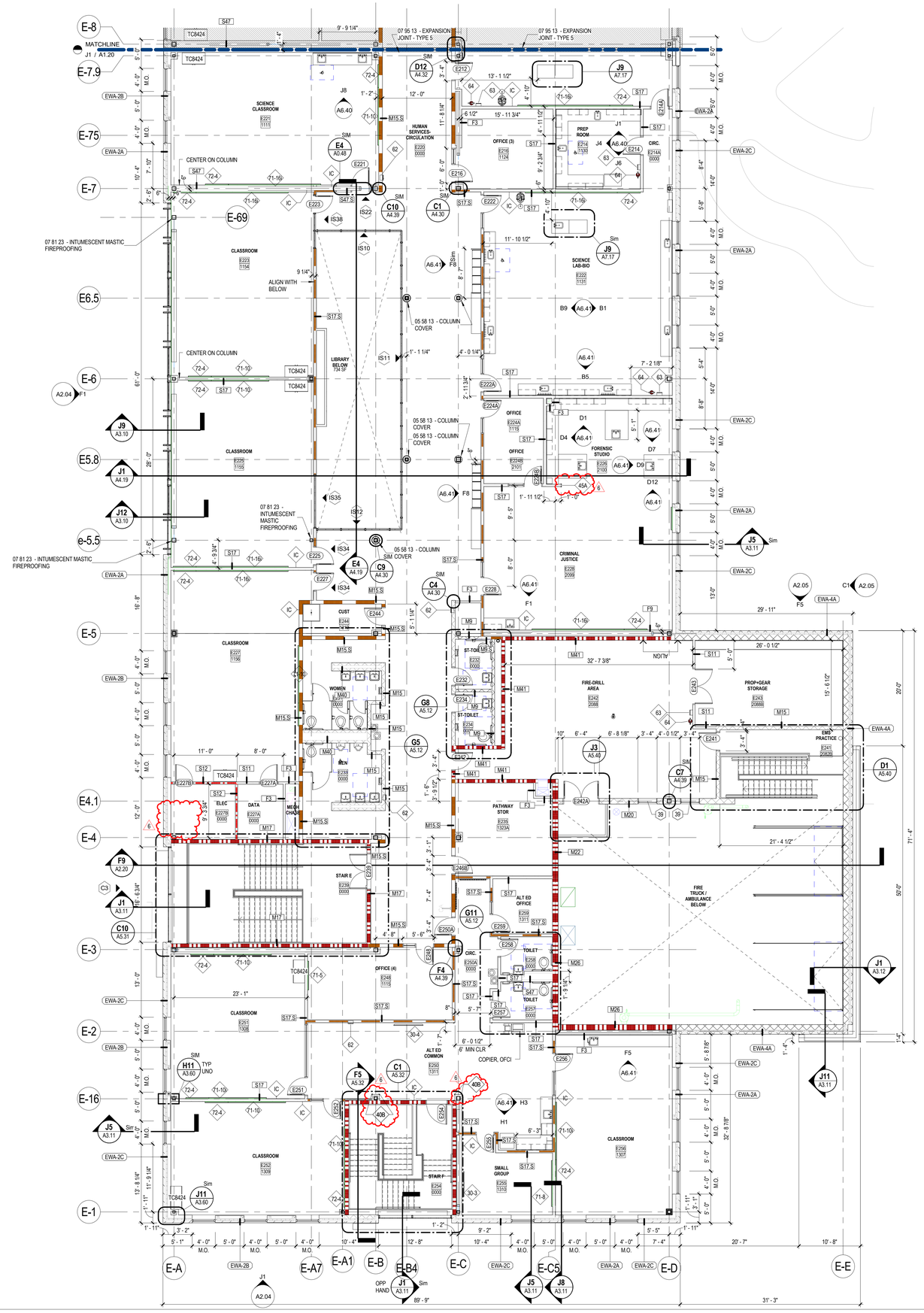

ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.

J1 A1.27 LEVEL 2 - AREA E
1/8" = 1'-0"

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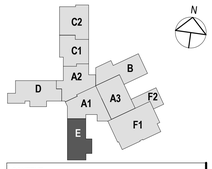
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR PLAN - AREA E

DRAWN BY: JMS
PROJECT NO: 12-067-00
DATE: 02/11/2016
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A1.27

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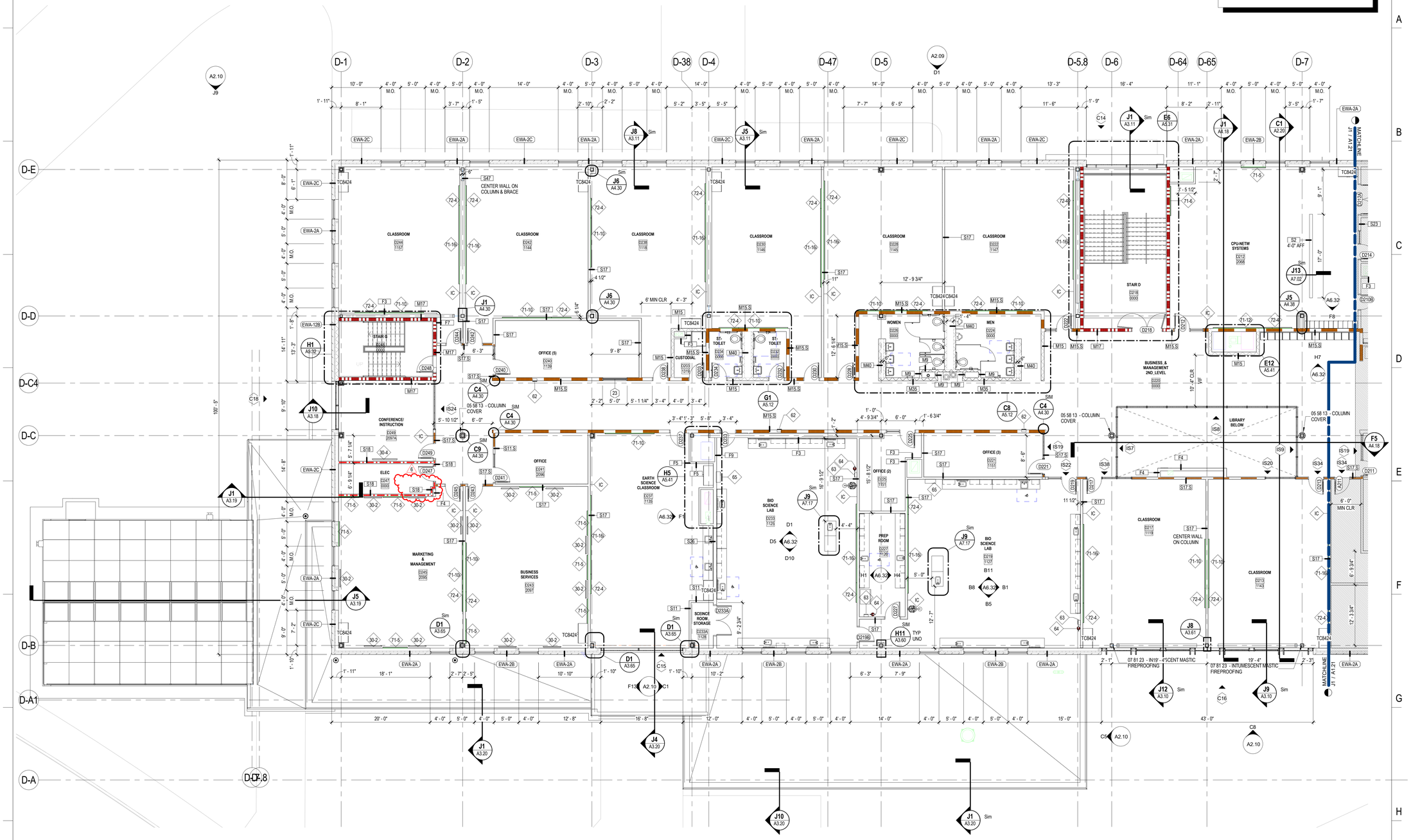
ENLARGED FLOOR PLAN NOTES:

1. ALL DIMENSIONS ARE TO FACE OF MASONRY OR FACE OF STUD, UNO.
2. ALL OPENINGS IN MASONRY CONSTRUCTION ARE DIMENSIONED TO THE FACE OF MASONRY.



J1 LEVEL 2 - AREA D
A1.26 1/8" = 1'-0"

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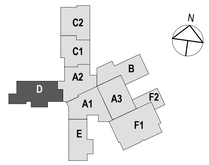
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR PLAN - AREA D

DRAWN BY:	JMS
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A1.26

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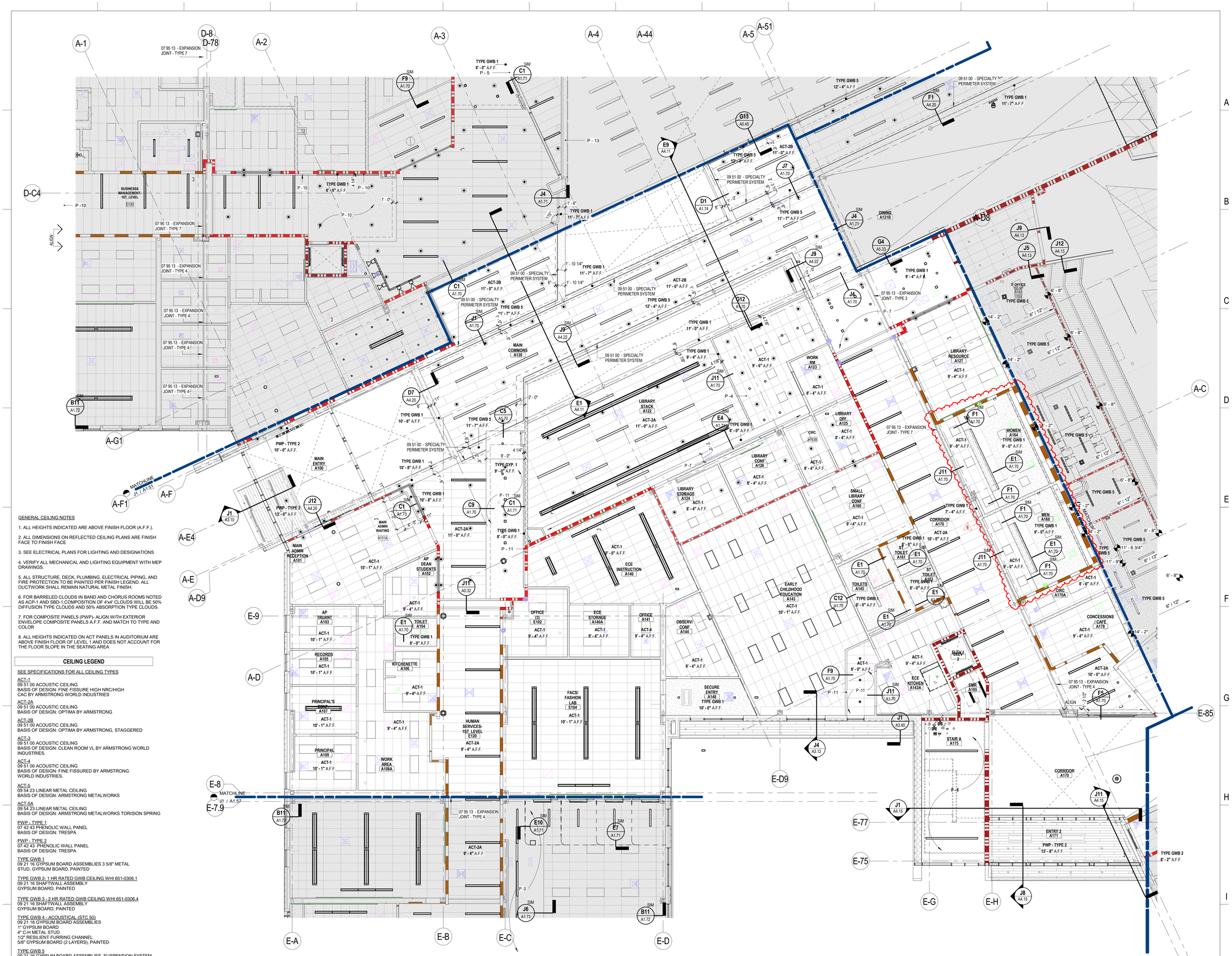

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP). ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2- 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

J1 LEVEL 1 RCP - AREA A1
A1.50 1/8" = 1'-0"

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6	Addendum 6	03/24/16

CONTENT:
FIRST FLOOR REFLECTED CEILING PLAN - AREA A1

DRAWN BY:	KMM
PROJECT NO:	12-067-00
DATE:	02/11/2016
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SCALE:	As indicated

A1.50

Project Phase
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J1 A1.53 LEVEL 1 RCP - AREA B
1/8" = 1'-0"

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1 COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2- 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

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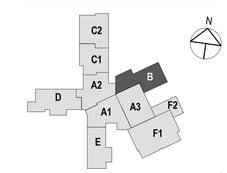

CONTENT:
FIRST FLOOR REFLECTED CEILING PLAN - AREA B

DRAWN BY:	KMM
PROJECT NO:	12-067-00
DATE:	02/11/2016
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SCALE:	As indicated

A1.53

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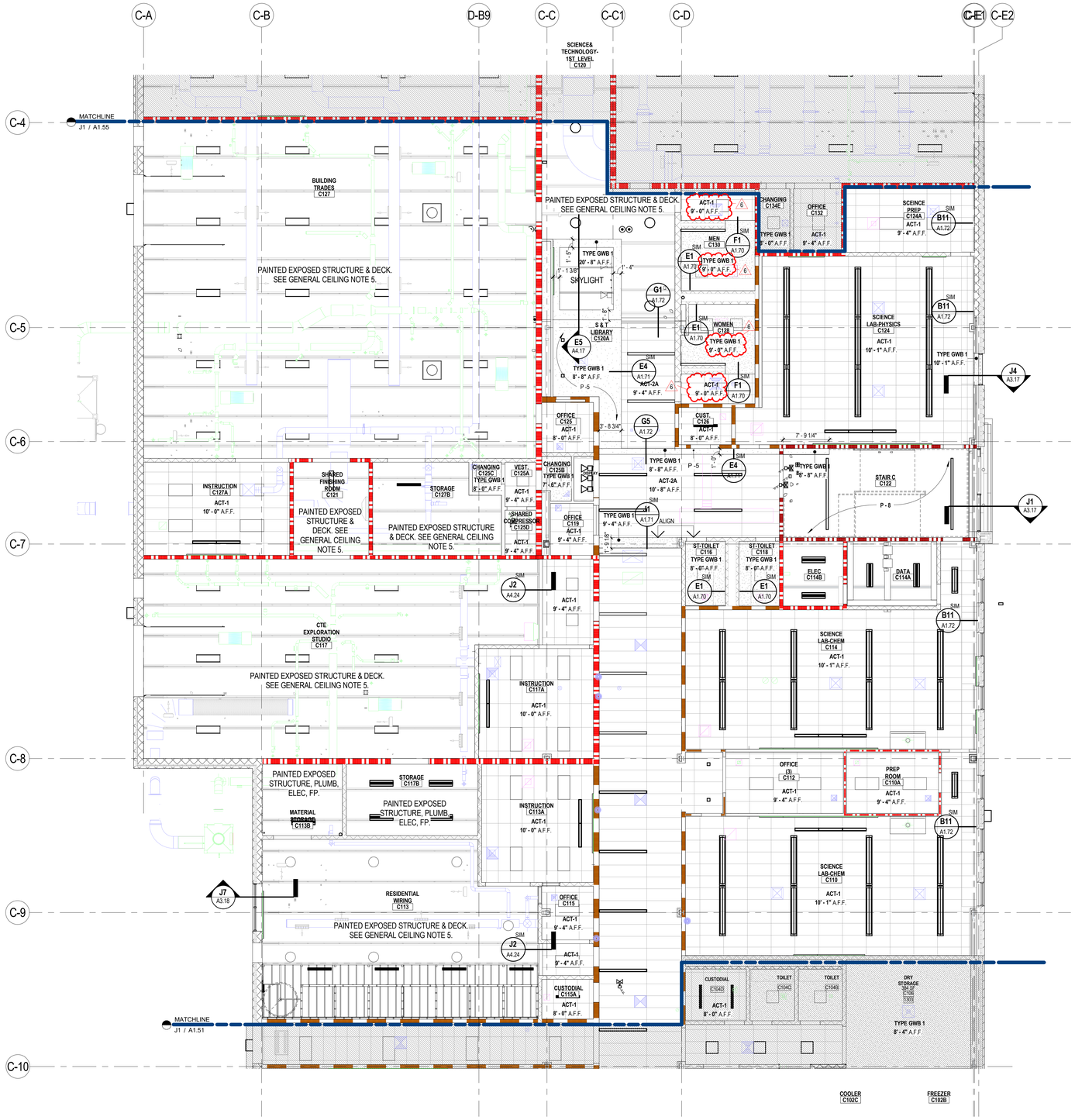

J1 A1.54 LEVEL 1 RCP - AREA C1
1/8" = 1'-0"

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2- 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

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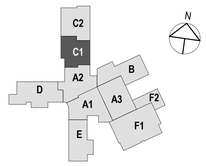

CONTENT:
FIRST FLOOR REFLECTED CEILING PLAN - AREA C1

DRAWN BY:	KMM
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DATE:	02/11/2016
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SCALE:	As indicated

A1.54

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GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

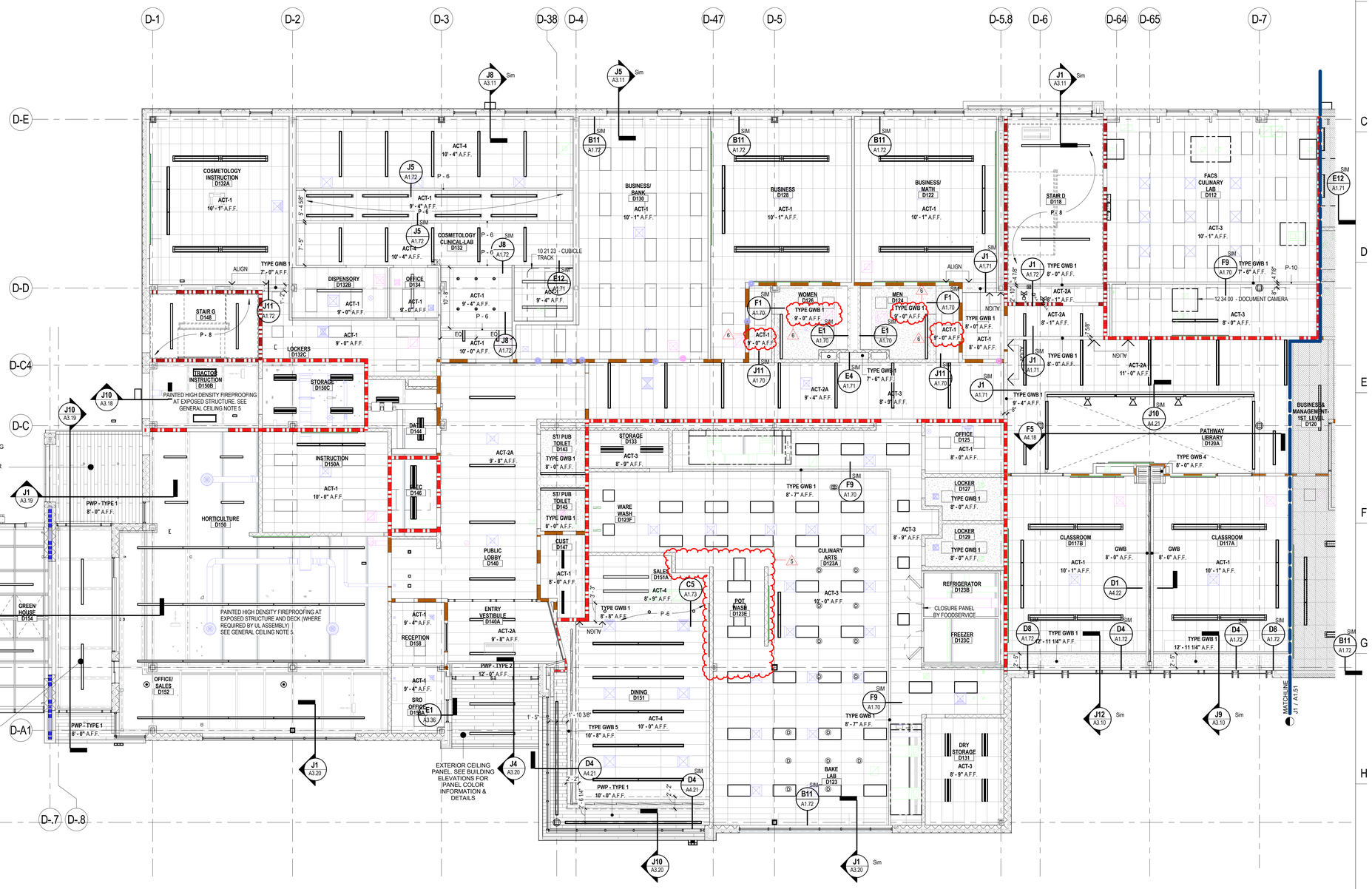
TYPE GWB 2- 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD



J1 A1.56 LEVEL 1 RCP - AREA D
1/8" = 1'-0"

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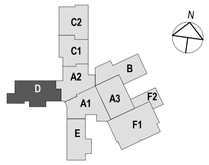
NO.	DESCRIPTION	DATE
5	Addendum 5	03/17/16
6	Addendum 6	03/24/16



CONTENT:
FIRST FLOOR REFLECTED CEILING PLAN - AREA D

DRAWN BY: KMM
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: As indicated

A1.56

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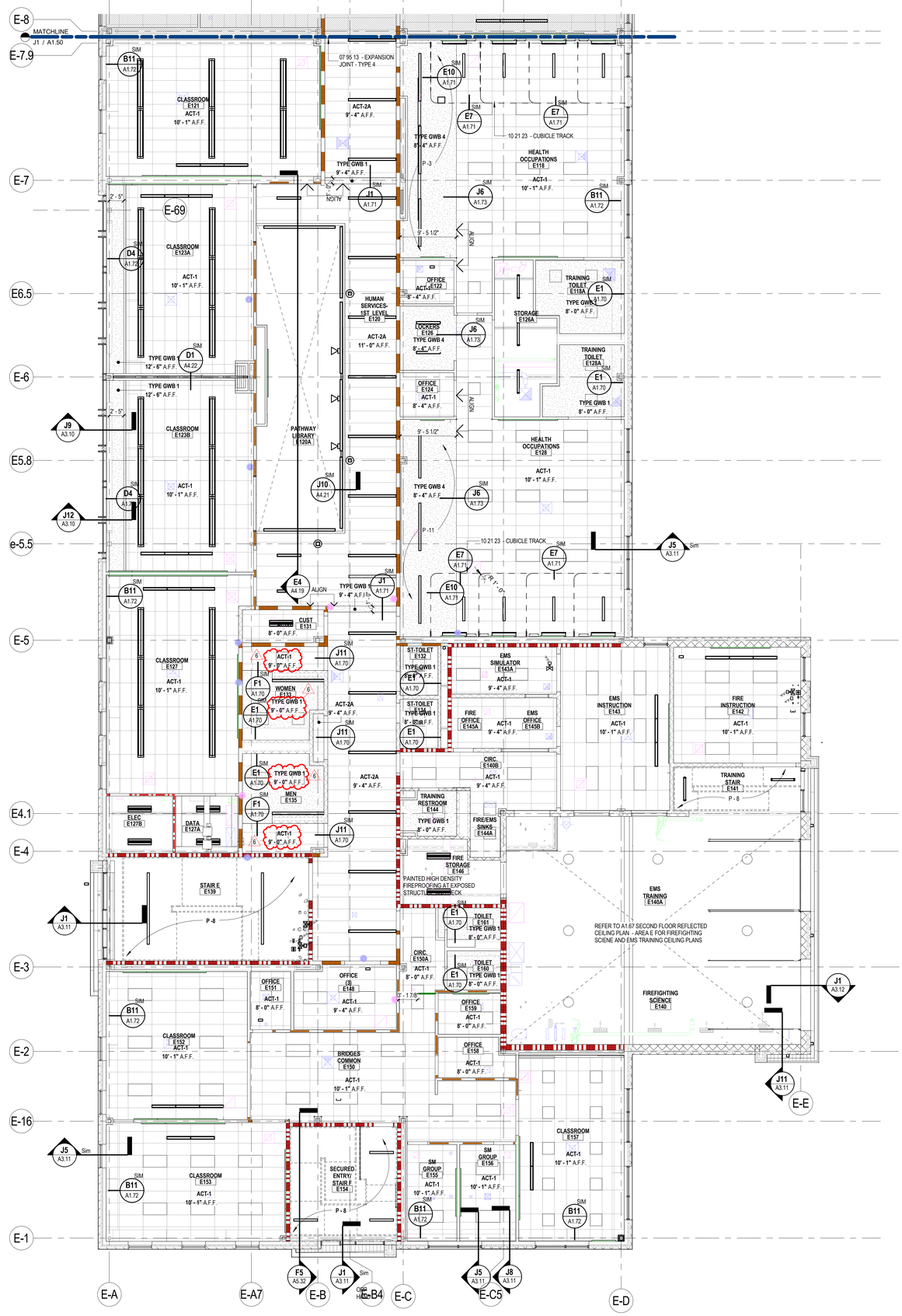

J1 LEVEL 1 RCP - AREA E
A1.57 1/8" = 1'-0"

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2- 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

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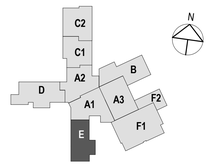
NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16



CONTENT:
FIRST FLOOR REFLECTED CEILING PLAN - AREA E

DRAWN BY:	KMM
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.57

Project Phase
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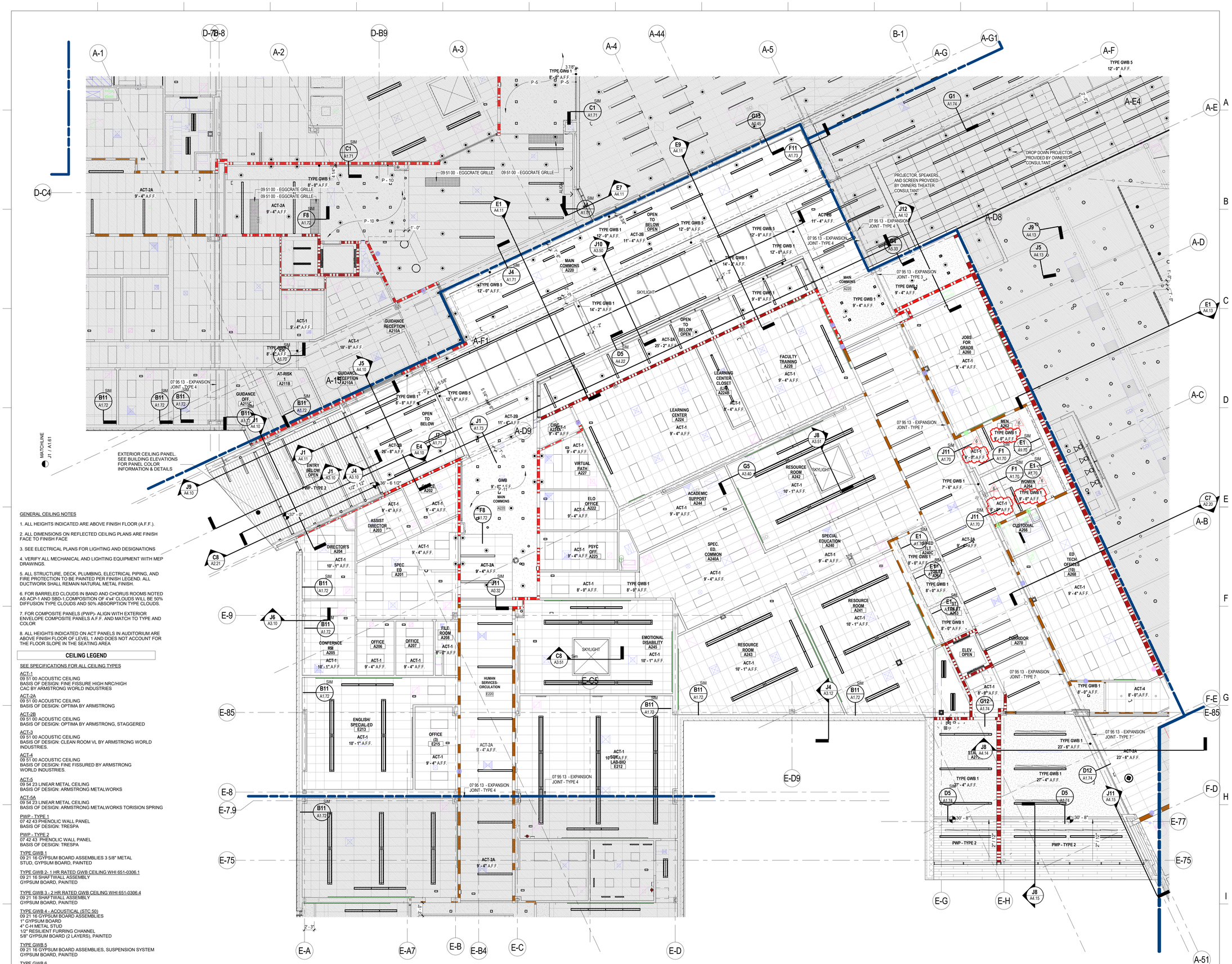

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2- 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

J1 A1.60 — LEVEL 2 RCP - AREA A1
1/8" = 1'-0"

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6	Addendum 6	03/24/16

CONTENT:
SECOND FLOOR REFLECTED CEILING PLAN - AREA A1

DRAWN BY: KMM
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: As indicated

A1.60

Project Phase
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CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2 - 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

J1 A1.63 LEVEL 2 RCP - AREA B
1/8" = 1'-0"

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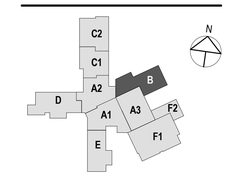
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR REFLECTED CEILING PLAN - AREA B

DRAWN BY:	KMM
PROJECT NO:	12-067-00
DATE:	02/11/2016
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SCALE:	As indicated

A1.63

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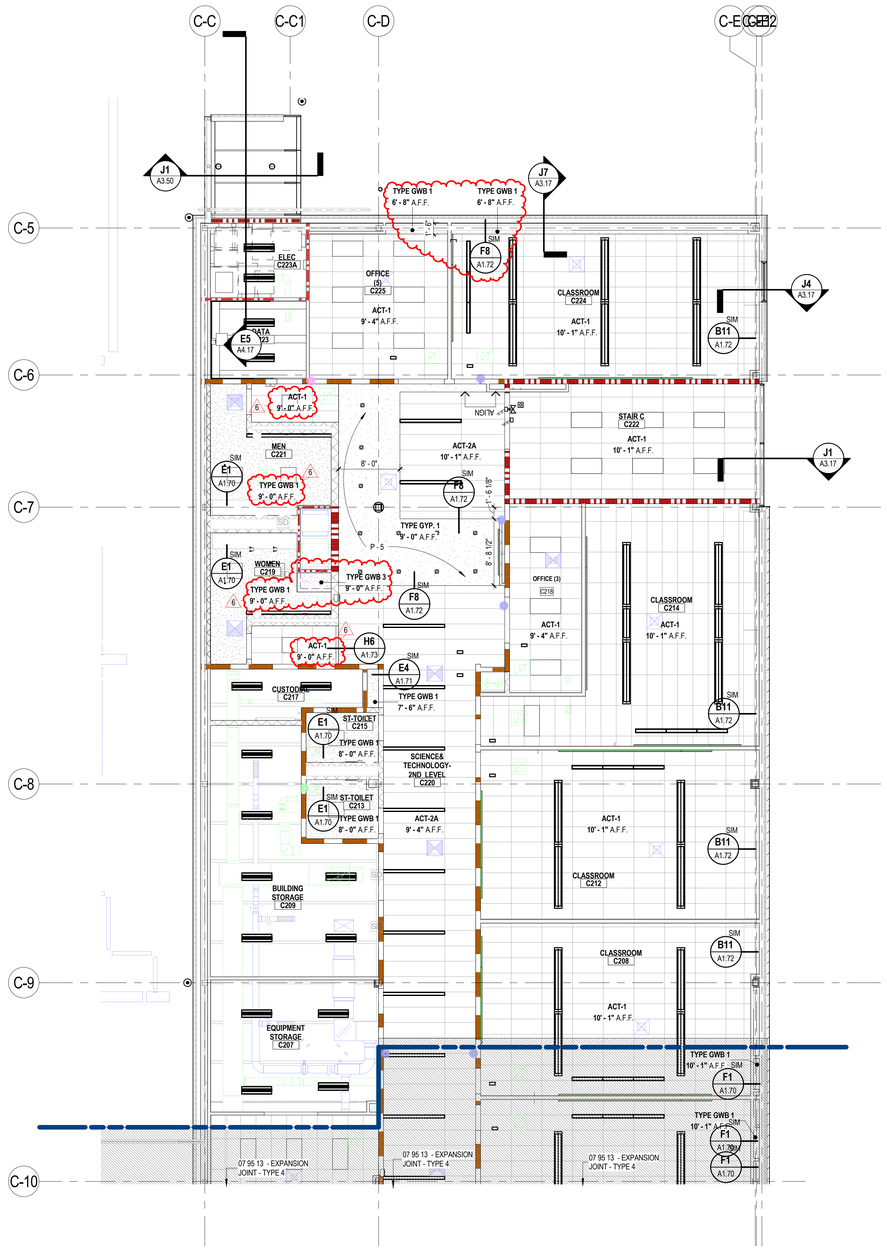

J1 A1.64 LEVEL 2 RCP - AREA C1
1/8" = 1'-0"

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2 - 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

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NO.	DESCRIPTION	DATE
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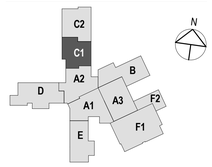

CONTENT:
SECOND FLOOR REFLECTED CEILING PLAN - AREA C1

DRAWN BY:	KMM
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A1.64

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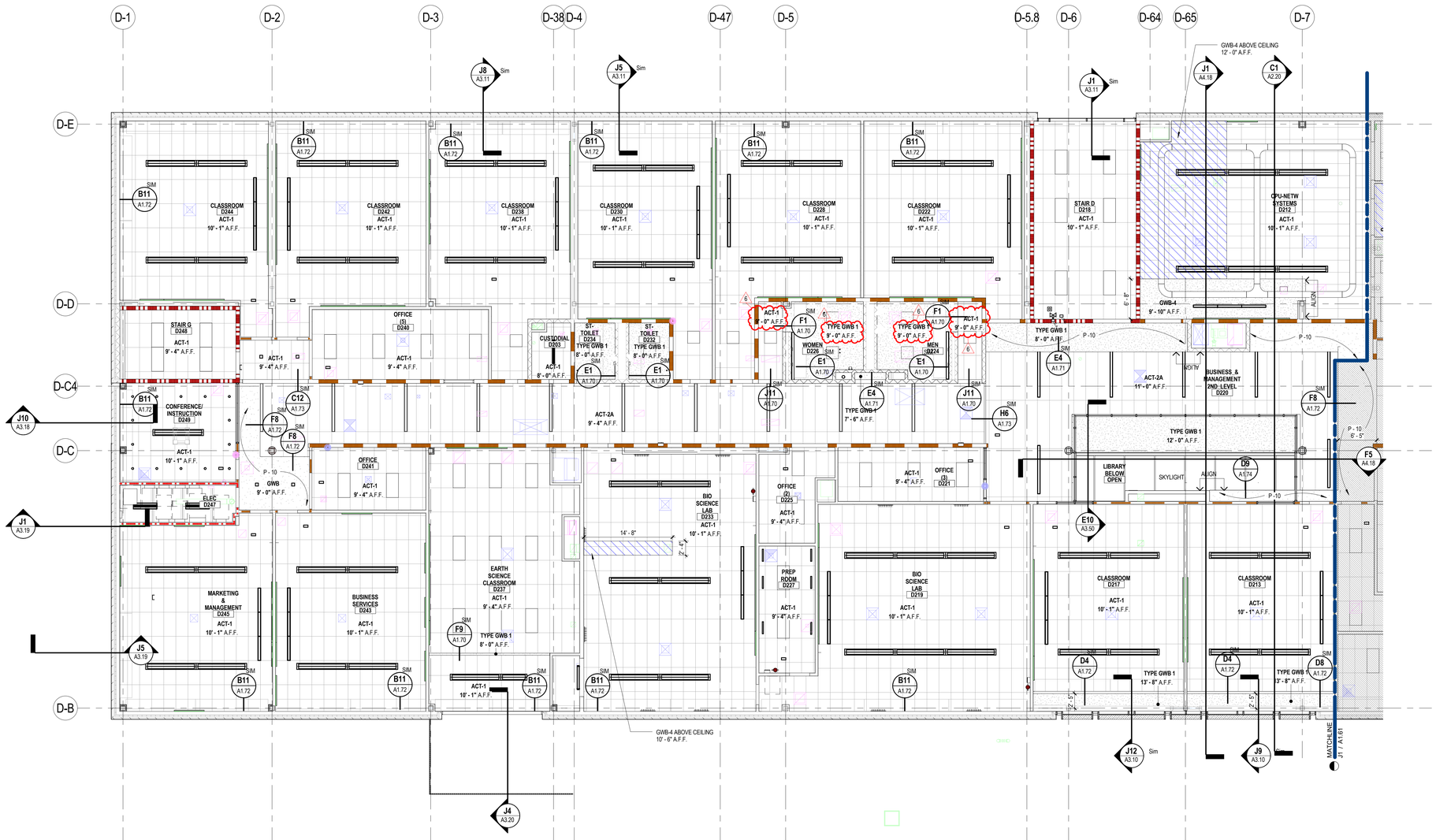

J1 A1.66 LEVEL 2 RCP - AREA D
1/8" = 1'-0"

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

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8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

ACT-1
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURE HIGH NRC/HIGH CAC BY ARMSTRONG WORLD INDUSTRIES

ACT-2A
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG

ACT-2B
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

ACT-3
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
09 21 16 GYPSUM BOARD ASSEMBLIES 3 5/8" METAL STUD, GYPSUM BOARD, PAINTED

TYPE GWB 2- 1 HR RATED GWB CEILING WHI 651-0306.1
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

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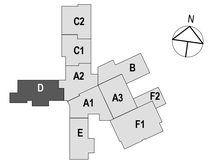
6	Addendum 6	03/24/16



CONTENT:
SECOND FLOOR REFLECTED CEILING PLAN - AREA D

DRAWN BY:	KMM
PROJECT NO:	12-067-00
DATE:	02/11/2016
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A1.66

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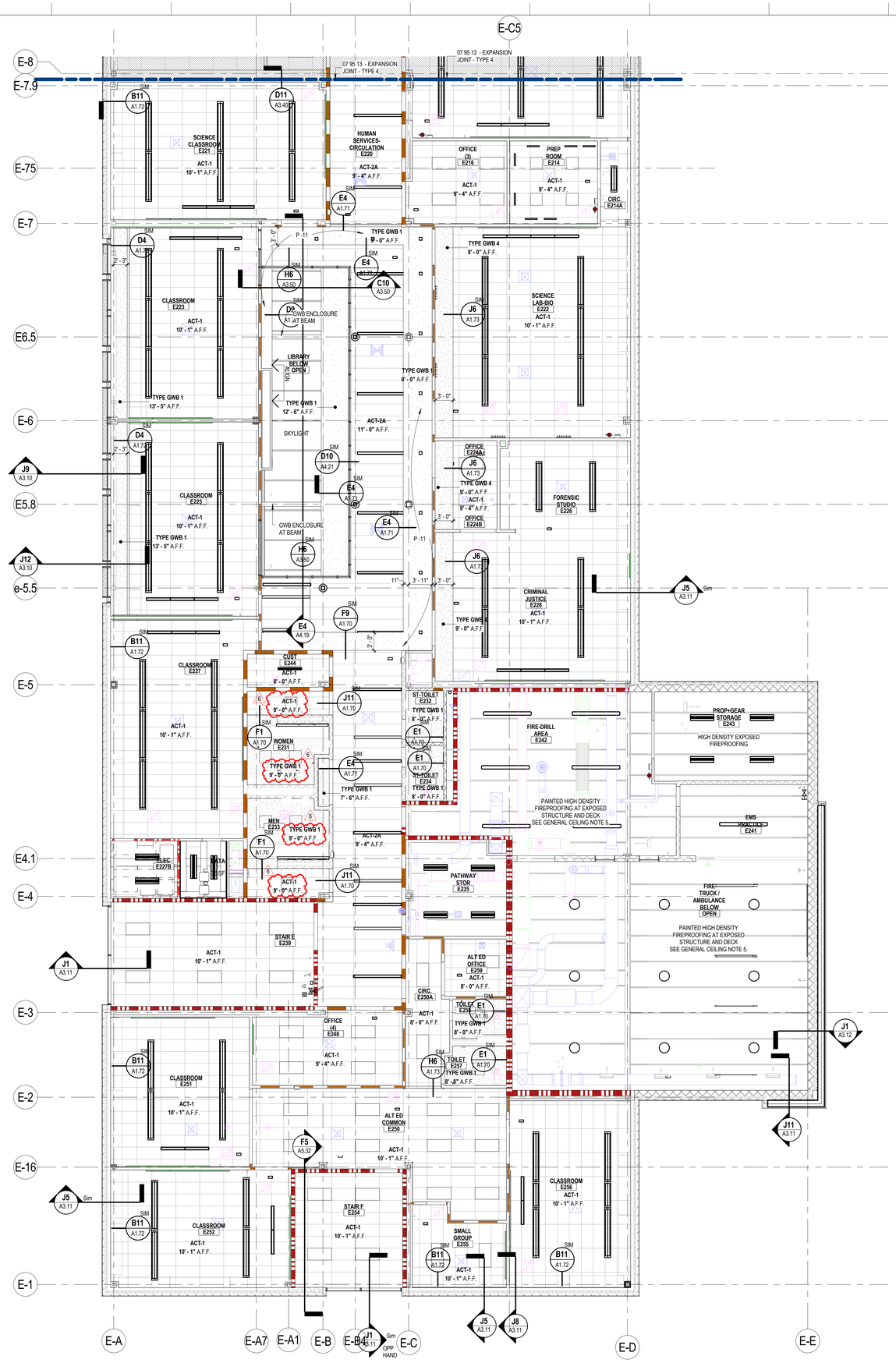

GENERAL CEILING NOTES

1. ALL HEIGHTS INDICATED ARE ABOVE FINISH FLOOR (A.F.F.).

2. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE FINISH FACE TO FINISH FACE

3. SEE ELECTRICAL PLANS FOR LIGHTING AND DESIGNATIONS

4. VERIFY ALL MECHANICAL AND LIGHTING EQUIPMENT WITH MEP DRAWINGS.

5. ALL STRUCTURE, DECK, PLUMBING, ELECTRICAL PIPING, AND FIRE PROTECTION TO BE PAINTED PER FINISH LEGEND. ALL DUCTWORK SHALL REMAIN NATURAL METAL FINISH.

6. FOR BARRELED CLOUDS IN BAND AND CHORUS ROOMS NOTED AS ACP-1 AND SBD-1,COMPOSITION OF 4'x4' CLOUDS WILL BE 50% DIFFUSION TYPE CLOUDS AND 50% ABSORPTION TYPE CLOUDS.

7. FOR COMPOSITE PANELS (PWP)- ALIGN WITH EXTERIOR ENVELOPE COMPOSITE PANELS A.F.F. AND MATCH TO TYPE AND COLOR

8. ALL HEIGHTS INDICATED ON ACT PANELS IN AUDITORIUM ARE ABOVE FINISH FLOOR OF LEVEL 1 AND DOES NOT ACCOUNT FOR THE FLOOR SLOPE IN THE SEATING AREA

CEILING LEGEND

SEE SPECIFICATIONS FOR ALL CEILING TYPES

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ACT-2A
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09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: OPTIMA BY ARMSTRONG, STAGGERED

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BASIS OF DESIGN: CLEAN ROOM VL BY ARMSTRONG WORLD INDUSTRIES.

ACT-4
09 51 00 ACOUSTIC CEILING
BASIS OF DESIGN: FINE FISSURED BY ARMSTRONG WORLD INDUSTRIES.

ACT-5
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS

ACT-5A
09 54 23 LINEAR METAL CEILING
BASIS OF DESIGN: ARMSTRONG METALWORKS TORISION SPRING

PWP - TYPE 1
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

PWP - TYPE 2
07 42 43 PHENOLIC WALL PANEL
BASIS OF DESIGN: TRESPA

TYPE GWB 1
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09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 3 - 2 HR RATED GWB CEILING WHI 651-0306.4
09 21 16 SHAFTWALL ASSEMBLY
GYPSUM BOARD, PAINTED

TYPE GWB 4 - ACOUSTICAL (STC 50)
09 21 16 GYPSUM BOARD ASSEMBLIES
1" GYPSUM BOARD
4" C-H METAL STUD
1/2" RESILIENT FURRING CHANNEL
5/8" GYPSUM BOARD (2 LAYERS), PAINTED

TYPE GWB 5
09 21 16 GYPSUM BOARD ASSEMBLIES, SUSPENSION SYSTEM
GYPSUM BOARD, PAINTED

TYPE GWB 6
09 24 00 PORTLAND CEMENT PLASTERING
3 5/8" METAL STUD

J1 A1.67 LEVEL 2 RCP - AREA E
1/8" = 1'-0"

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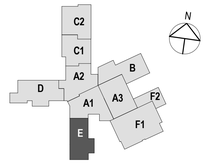

CONTENT:
SECOND FLOOR REFLECTED CEILING PLAN - AREA E

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A1.67

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BUILDING ASSEMBLIES: SEE ELEVATIONS FOR EXACT LOCATION OF WALL TYPES.

EWA - 1:
04 20 00 - FACING BRICK (SEE ELEVATIONS FOR TYPE)
1 3/4" AIR SPACE
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
04 20 00 - 12" CMU

EWA - 2:
04 20 00 - FACING BRICK (SEE ELEVATIONS FOR TYPE)
EWA - 2A 1 3/4" AIR SPACE
EWA - 2B 3/4" AIR SPACE,
EWA - 2C 2-3/4" AIR SPACE
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
04 20 00 - 8" CMU

EWA - 3:
04 20 00 - MASONRY VENEER (SEE ELEVATIONS FOR TYPE)
1 3/4" AIR SPACE
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
04 20 00 - 8" CMU

EWA - 4:
04 20 00 - MASONRY VENEER (SEE ELEVATIONS FOR TYPE)
EWA - 4A 1 3/4" AIR SPACE
EWA - 4B 3/4" AIR SPACE,
EWA - 4C 1 3/8" AIR SPACE
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
04 20 00 - 12" CMU

EWA - 5:
04 20 00 - MASONRY VENEER (SEE ELEVATIONS FOR TYPE)
EWA - 5A 1 3/4" AIR SPACE
EWA - 5B 3/4" AIR SPACE
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
05 40 00 - GYP SHEATHING
05 40 00 - CFMF 6" STUD
09 21 16 - GYPSUM BD-5/8"

EWA - 6:
04 20 00 - MASONRY VENEER (SEE ELEVATIONS FOR TYPE)
1 3/4" AIR SPACE
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
05 40 00 - GYP SHEATHING
05 40 00 - CFMF 6" STUD

EWA - 7:
07 42 13 - PHENOLIC WALL PANEL (SEE ELEVATIONS FOR TYPE)
07 42 13 - UNIVERSAL CLIP
07 42 13 - SUB-GIRT
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
05 40 00 - GYP SHEATHING
05 40 00 - CFMF 2-1/2" STUD
05 40 00 - CFMF 6" STUD

EWA - 8:
07 42 13 - PHENOLIC WALL PANEL (SEE ELEVATIONS FOR TYPE)
07 42 13 - UNIVERSAL CLIP
07 42 13 - SUB-GIRT
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
05 40 00 - GYP SHEATHING
05 40 00 - CFMF 6" STUD
09 21 16 - GYPSUM BD-5/8"

EWA - 9:
07 42 13 - PHENOLIC WALL PANEL (SEE ELEVATIONS FOR TYPE)
07 42 13 - UNIVERSAL CLIP
07 42 13 - SUB-GIRT
07 25 00 - WEATHER BARRIER SYSTEM #2
06 10 54 - FR PLYWOOD
05 40 00 - CFMF 6" STUD /
05 40 00 - CFMF 3-5/8" STUD
(SEE DETAIL FOR TYPE)

EWA - 10:
07 42 13 - MTL WALL PANEL
07 42 13 - SUB-GIRT
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
04 20 00 - 12" CMU

EWA - 11:
07 42 13 - MTL WALL PANEL
07 42 13 - SUB-GIRT
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
05 40 00 - GYP SHEATHING
05 40 00 - CFMF 6" STUD
09 21 16 - GYPSUM BD-5/8"

EWA - 12:
04 20 00 - FACING BRICK (SEE ELEVATIONS FOR TYPE)
EWA-12A 1 3/4" AIR SPACE
EWA-12B 2 3/4" AIR SPACE
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
04 20 00 - 8" CMU

EWA - 13:
07 42 13 - PHENOLIC WALL PANEL (SEE ELEVATIONS FOR TYPE)
07 42 13 - UNIVERSAL CLIP
07 42 13 - SUB-GIRT
07 21 00 - RIGID EXTERIOR WALL INSUL BD
07 25 00 - WEATHER BARRIER SYSTEM #1
05 40 00 - GYP SHEATHING
05 40 00 - CFMF 6" STUD
04 20 00 - 12" CMU
09 21 16 - FURRING CHANNEL
07 42 13 - UNIVERSAL CLIP
07 42 13 - PHENOLIC WALL PANEL (PWP TYPE 2)

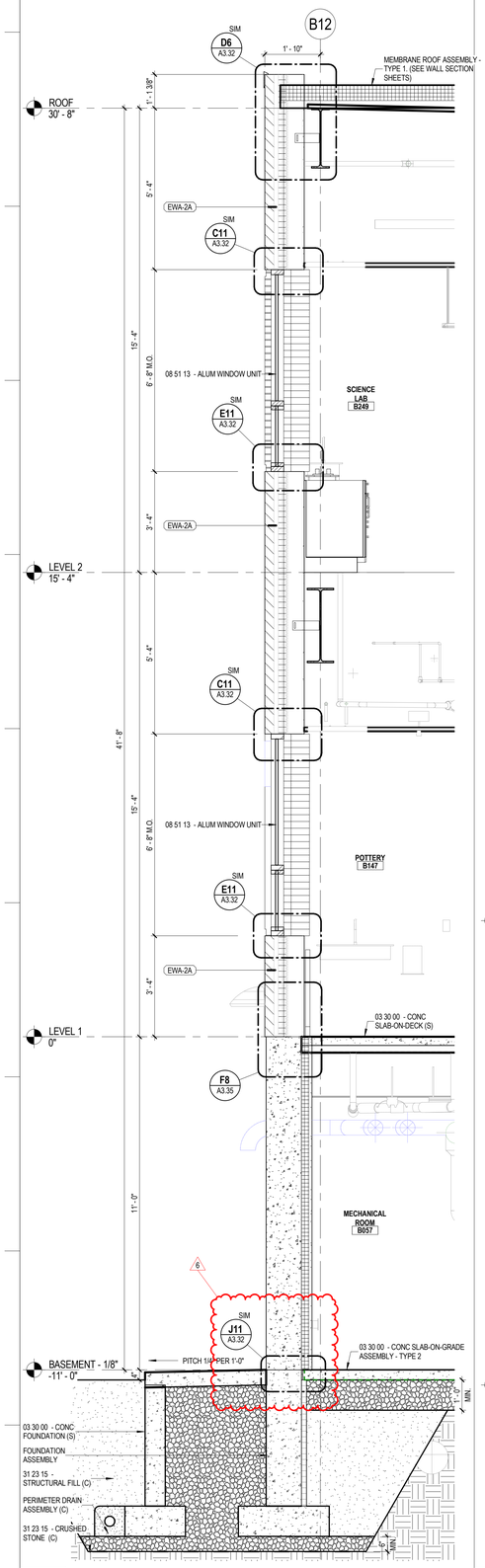
FOUNDATION ASSEMBLY:
03 30 00 - CONC FOUNDATION (S)
07 21 00 - RIGID PERIMETER INSUL BD

PERIMETER DRAIN ASSEMBLY (C):
33 46 00 - FILTER FABRIC
31 23 15 - UNDERDRAIN SAND (C) (SEE GEOTECH REPORT)
33 46 00 - FOUNDATION DRAIN
SEE FOUNDATION PLAN LOCATION

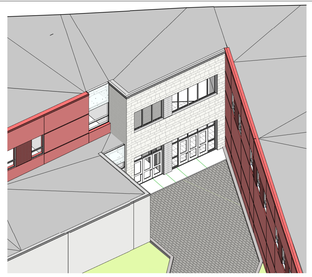
MEMBRANE ROOF ASSEMBLY - TYPE 1:
07 53 00 - MEMBRANE ROOF-ADHERED
07 53 00 - RIGID ROOF INSULATION
07 53 00 - ROOF AIR-VAPOR BARRIER
05 30 00 - METAL ROOF DECK (S)

CONC SLAB-ON-GRADE ASSEMBLY - TYPE 1:
03 30 00 - CONC SLAB-ON-GRADE
03 30 00 - UNDERSLAB VAPOR RETARDER
31 23 15 - STONE DUST (C) (SEE GEOTECH REPORT)

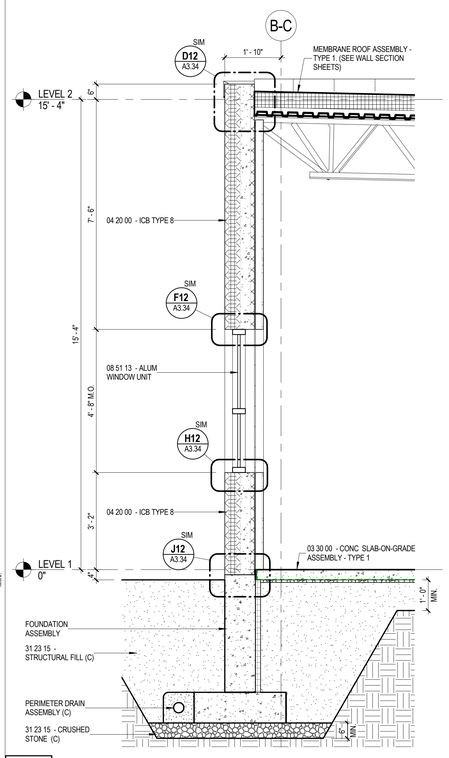
CONC SLAB-ON-GRADE ASSEMBLY - TYPE 2:
03 30 00 - CONC SLAB-ON-GRADE
03 30 00 - UNDERSLAB VAPOR RETARDER
31 23 15 - GEOTEXTILE FABRIC (C) (SEE GEOTECH REPORT)
31 23 15 - CRUSHED STONE (C) (SEE GEOTECH REPORT)
31 23 15 - GEOTEXTILE FABRIC (C) (SEE GEOTECH REPORT)



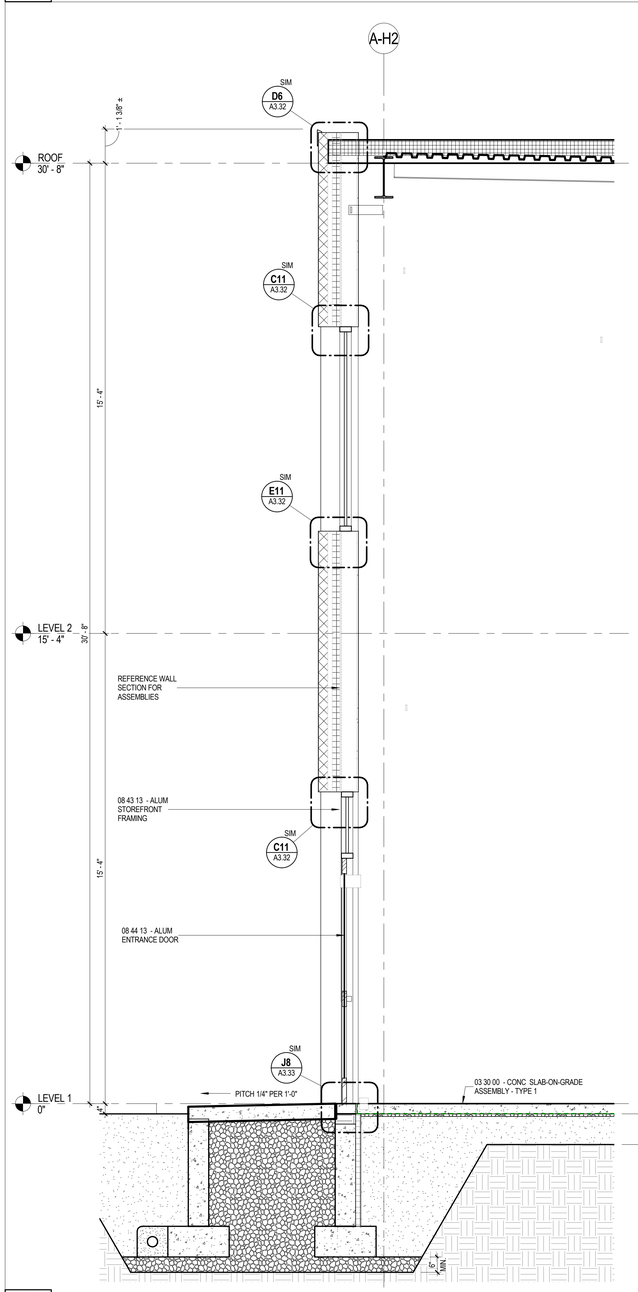
J1 A3.16 WALL SECTION AT ARTS WING
1/2" = 1'-0"



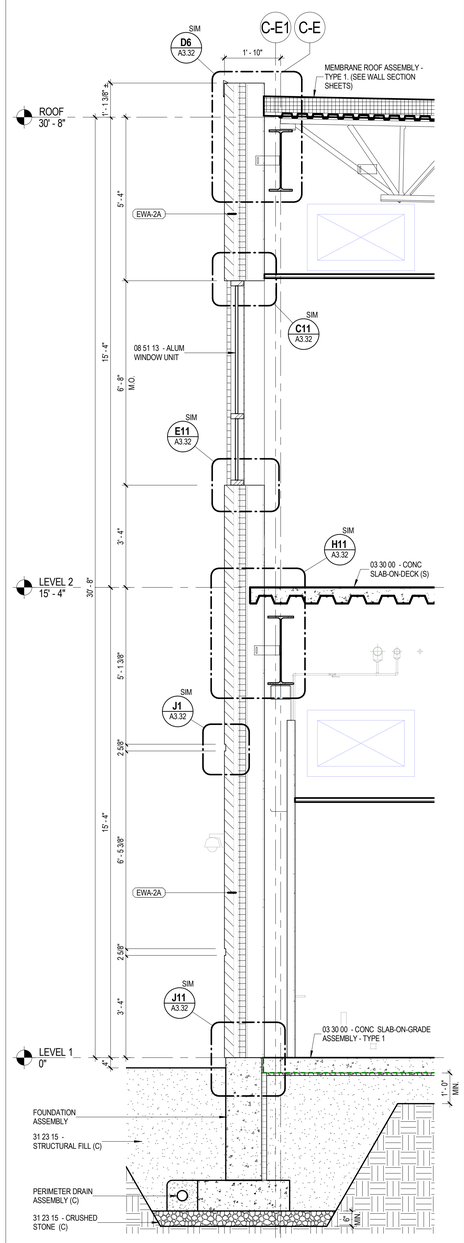
C7 A3.16 AXON - EXTERIOR AT DINNING EXIT



J4 A3.16 WALL SECTION AT INSULATED BLOCK MASONRY WALL1
1/2" = 1'-0"



J7 A3.16 WALL SECTION THROUGH CANOPY AT DINING EXIT
1/2" = 1'-0"



J12 A3.16 TYP. WALL SECTION AT MASONRY WALL
1/2" = 1'-0"

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CONTENT: WALL SECTIONS

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A3.16

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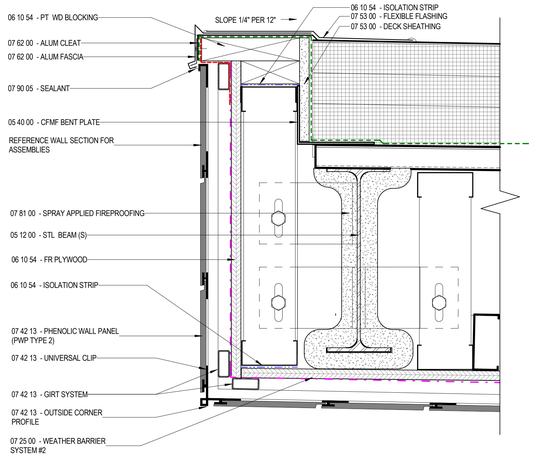
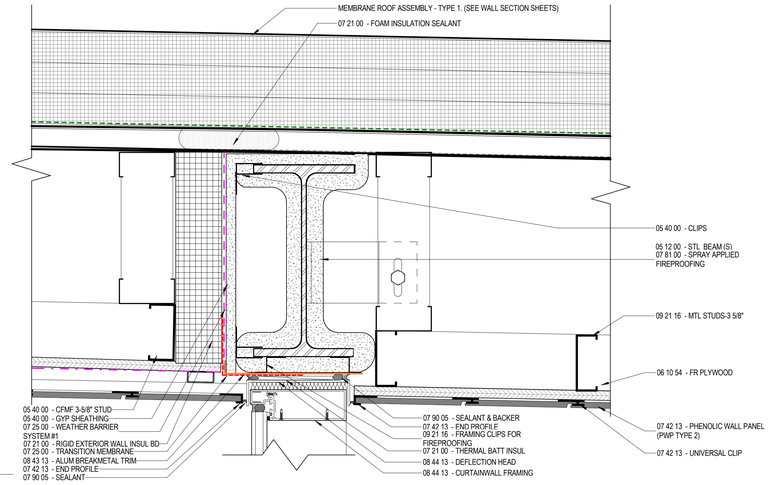
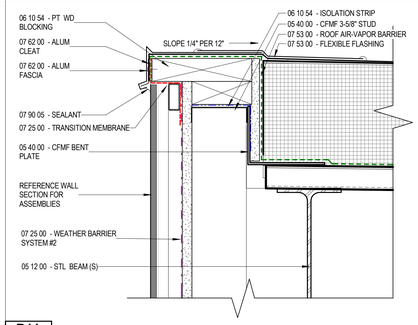
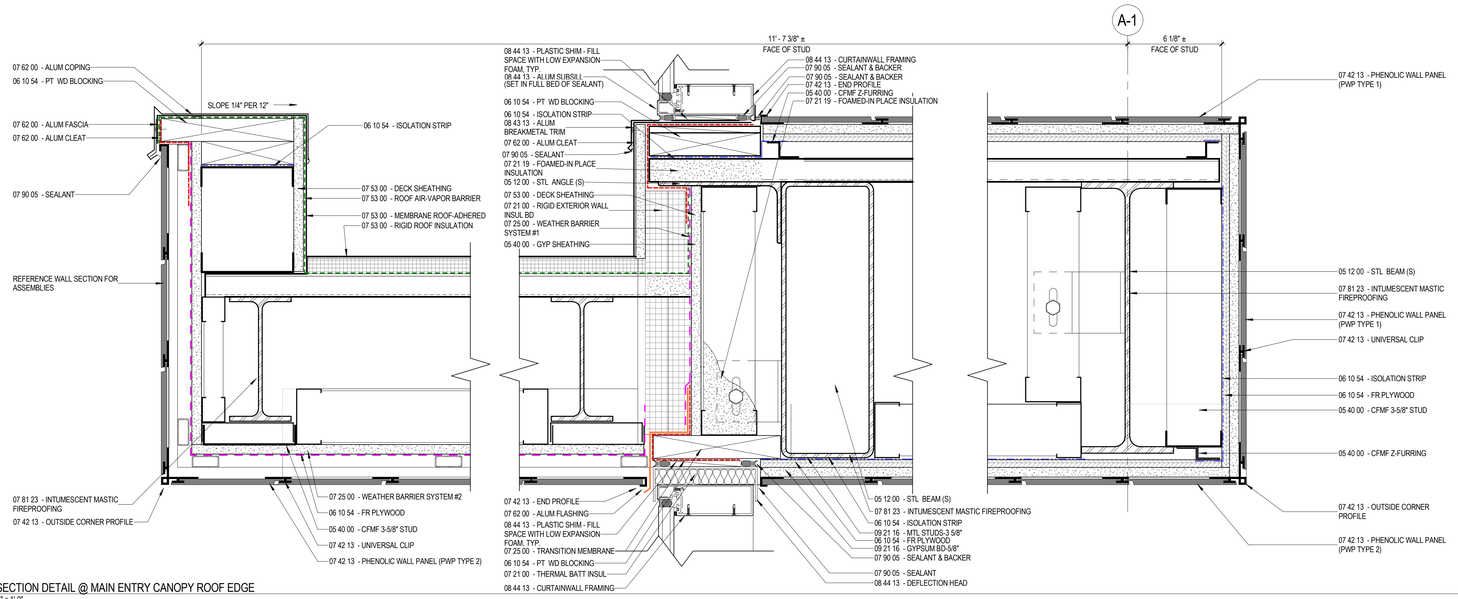




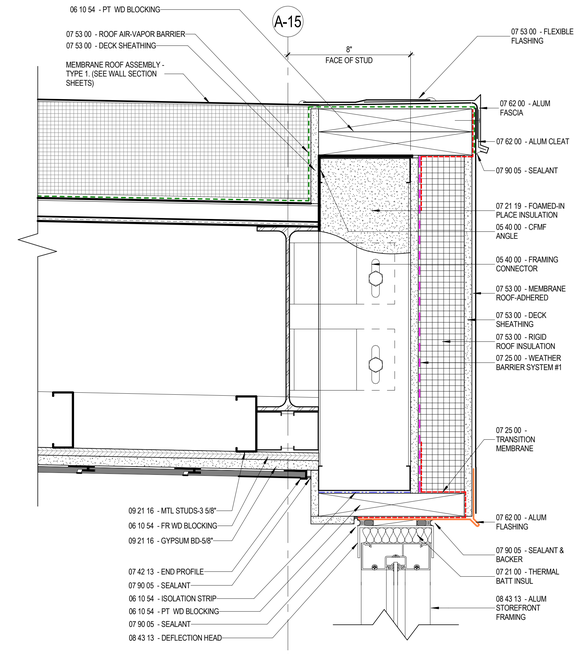
C1 A3.31 SECTION DETAIL AT MAIN ENTRY CANOPY ROOF EDGE
3" = 1'-0"

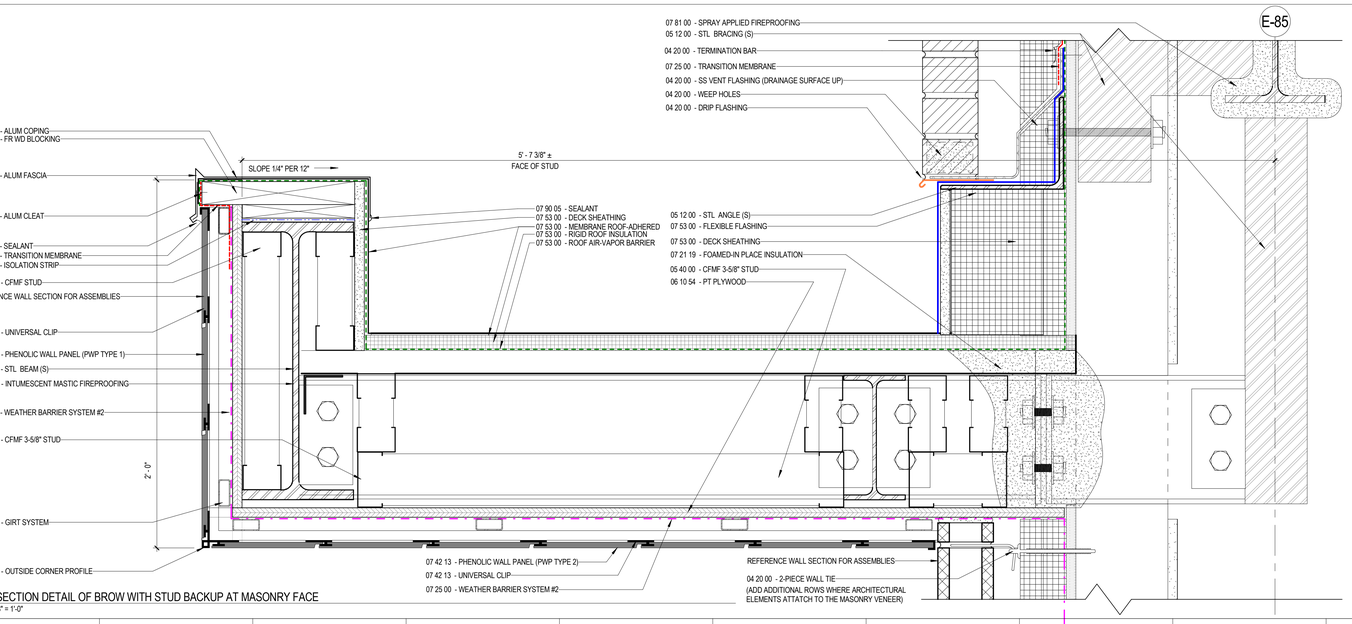


B11 A3.31 TYP. DETAIL AT PHENOLIC PANEL ROOF EDGE
3" = 1'-0"

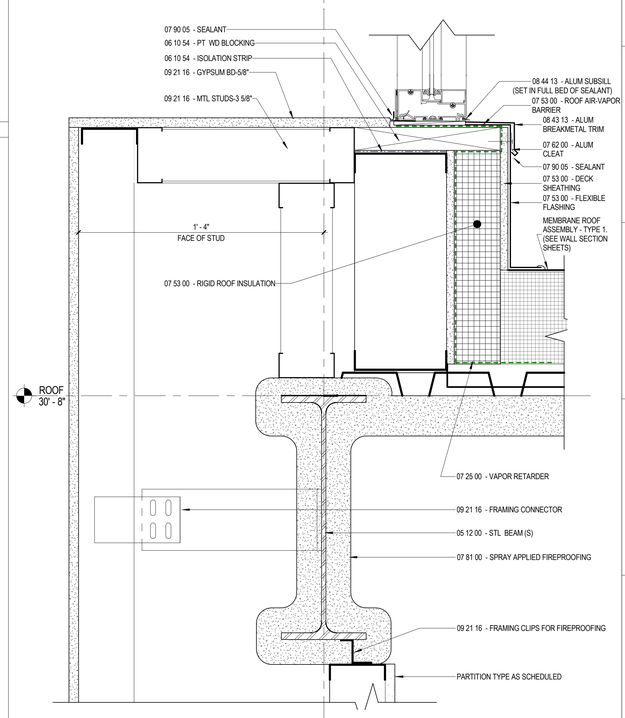


G1 A3.31 SECTION DETAIL @ MAIN ENTRY CANOPY ROOF EDGE
3" = 1'-0"





J1 A3.31 SECTION DETAIL OF BROW WITH STUD BACKUP AT MASONRY FACE
3" = 1'-0"



J11 A3.31 SECTION DETAIL AT REAR CLERESTORY WINDOW AT MAIN ENTRY
3" = 1'-0"

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CONTENT:
WALL SECTION DETAILS

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PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	3" = 1'-0"

A3.31

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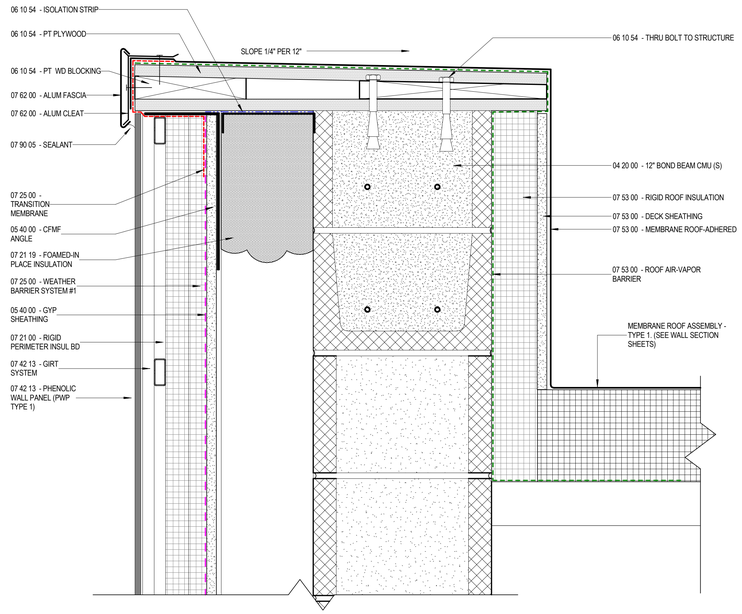
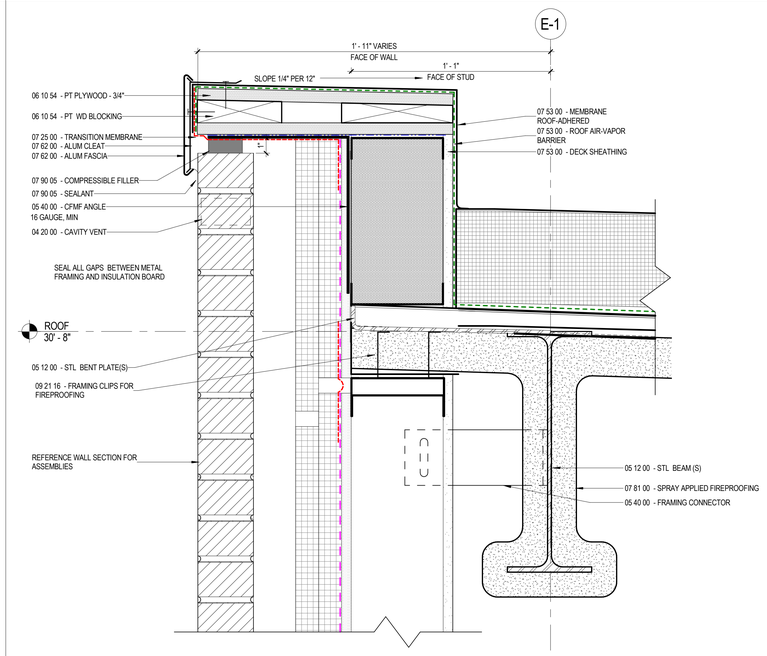
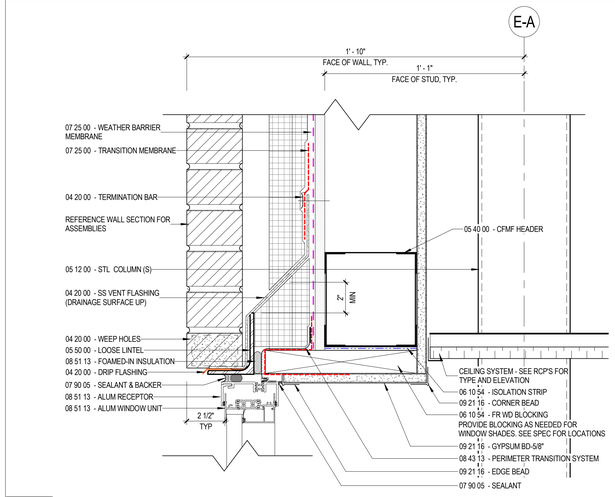


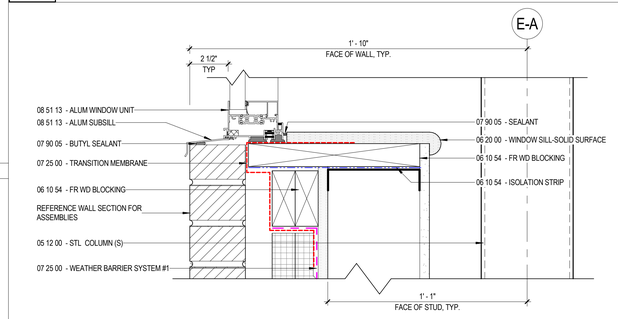
D1 A3.32 SECTION DETAIL OF ROOF EDGE AT GYM ENTRY
3" = 1'-0"



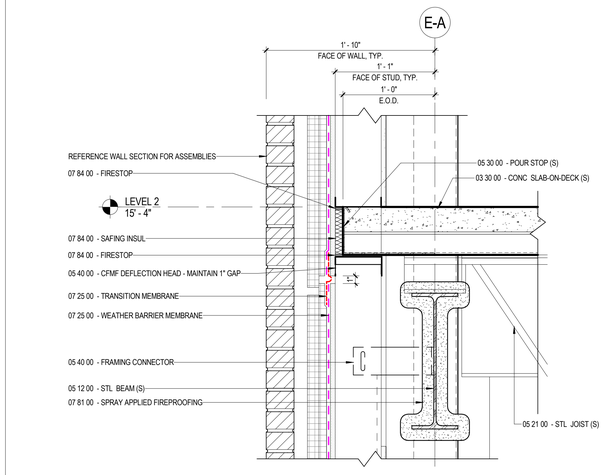
D6 A3.32 SECTION DETAIL OF MASONRY FACE WITH STUD BACKUP AT ROOF
3" = 1'-0"



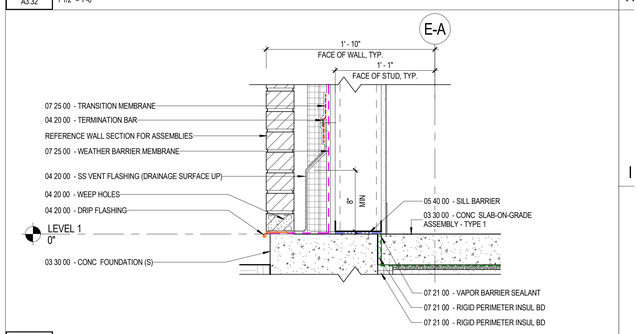
C11 A3.32 TYP. SECTION DETAIL OF MASONRY FACE WITH STUD BACKUP AT WINDOW HEAD
3" = 1'-0"



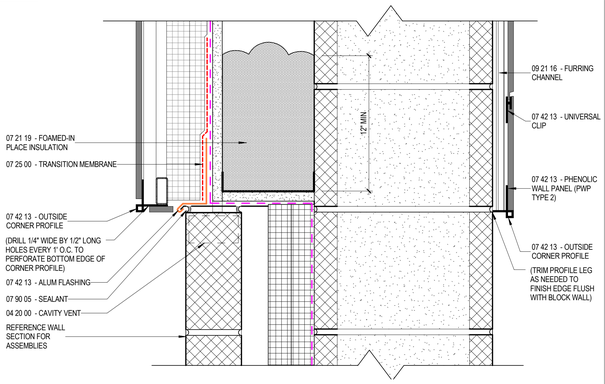
E11 A3.32 TYP. SECTION DETAIL OF MASONRY FACE WITH STUD BACKUP AT WINDOW SILL
3" = 1'-0"



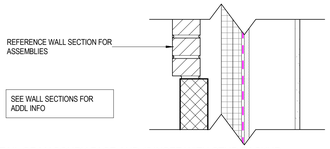
H11 A3.32 TYP. SECTION DETAIL OF STUD BACKUP AT SLAB EDGE
1 1/2" = 1'-0"



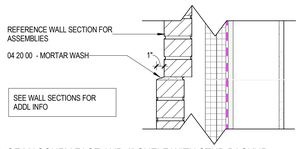
J11 A3.32 TYP. SECTION DETAIL OF MASONRY FACE WITH STUD BACKUP AT FOUNDATION
1 1/2" = 1'-0"



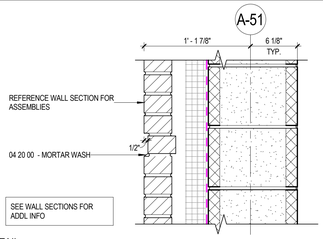
G1 A3.32 SECTION DETAIL OF MTL. FACE ABOVE MASONRY FACE INSET AT GYM ENTRY
3" = 1'-0"



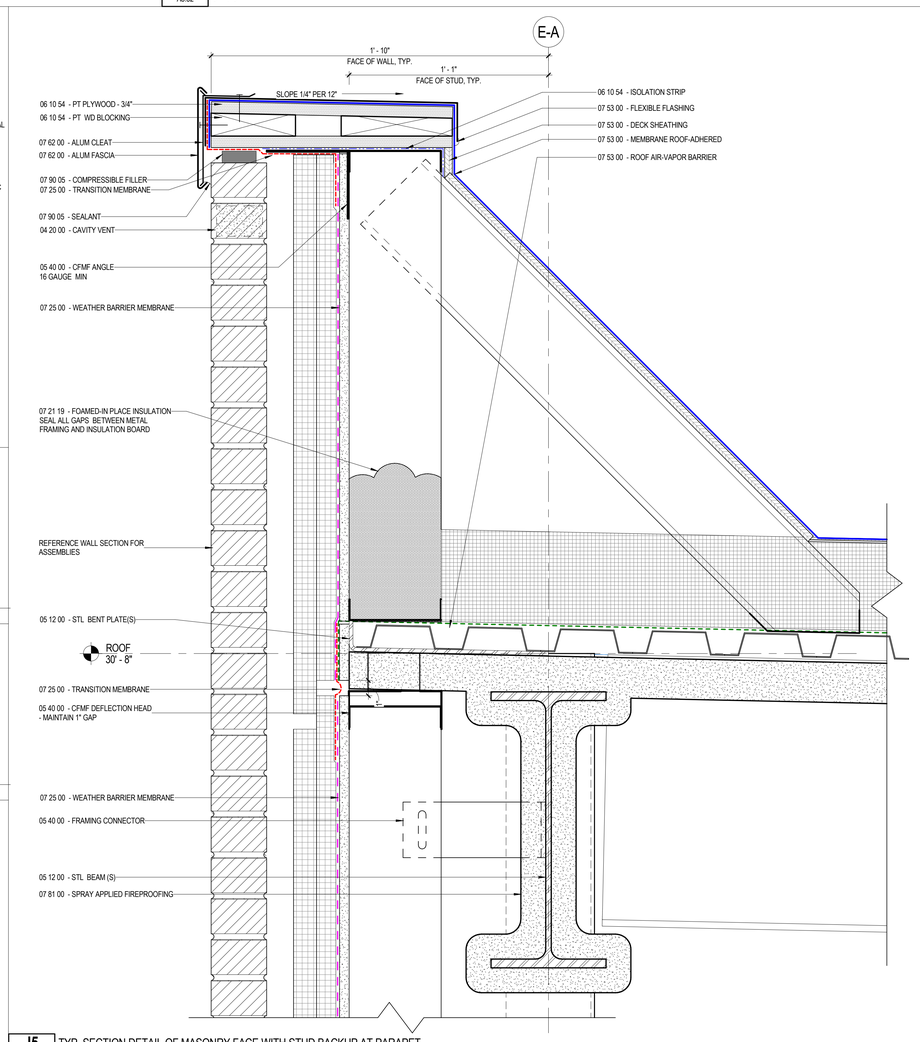
H1-X02 A3.32 SECTION DETAIL OF MASONRY FACE AND 1" INSET WITH STUD BACKUP
1 1/2" = 1'-0"



H1 A3.32 SECTION DETAIL OF MASONRY FACE AND 1" SHELF WITH STUD BACKUP
1 1/2" = 1'-0"



J1 A3.32 BRICK REVEAL DETAIL
1 1/2" = 1'-0"



J5 A3.32 TYP. SECTION DETAIL OF MASONRY FACE WITH STUD BACKUP AT PARAPET
3" = 1'-0"

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6	Addendum 6	03/24/16

CONTENT: WALL SECTION DETAILS

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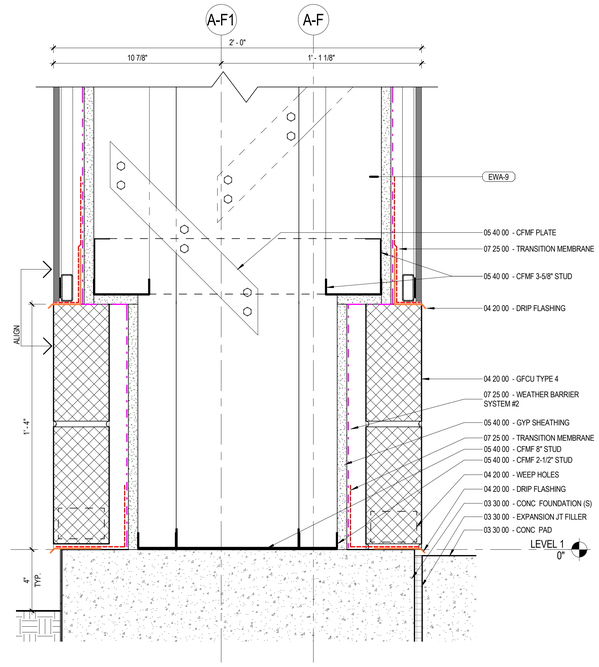
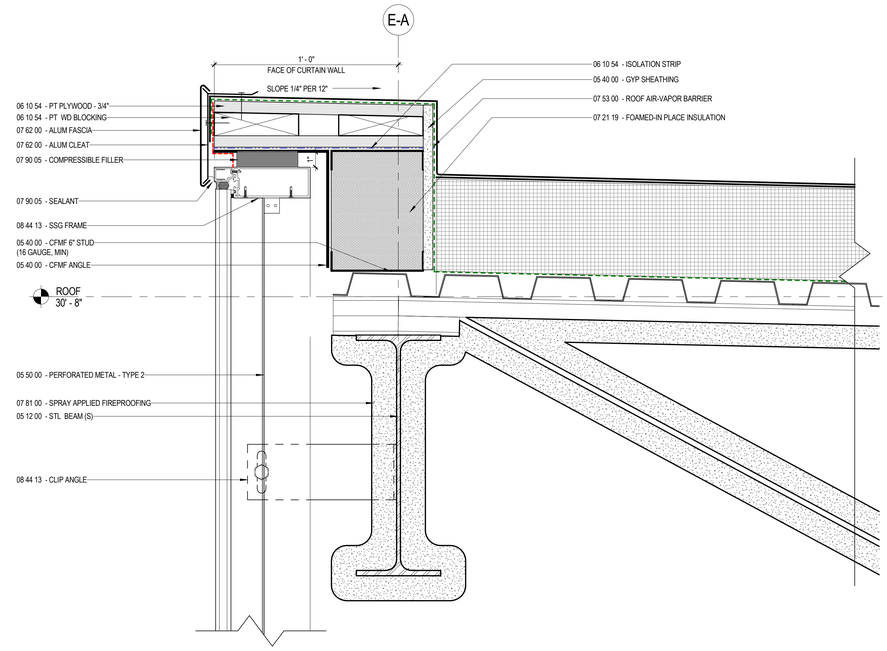
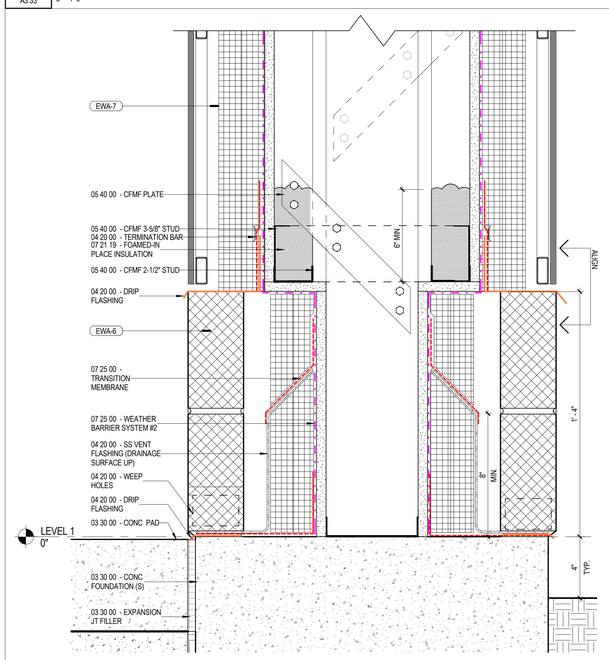


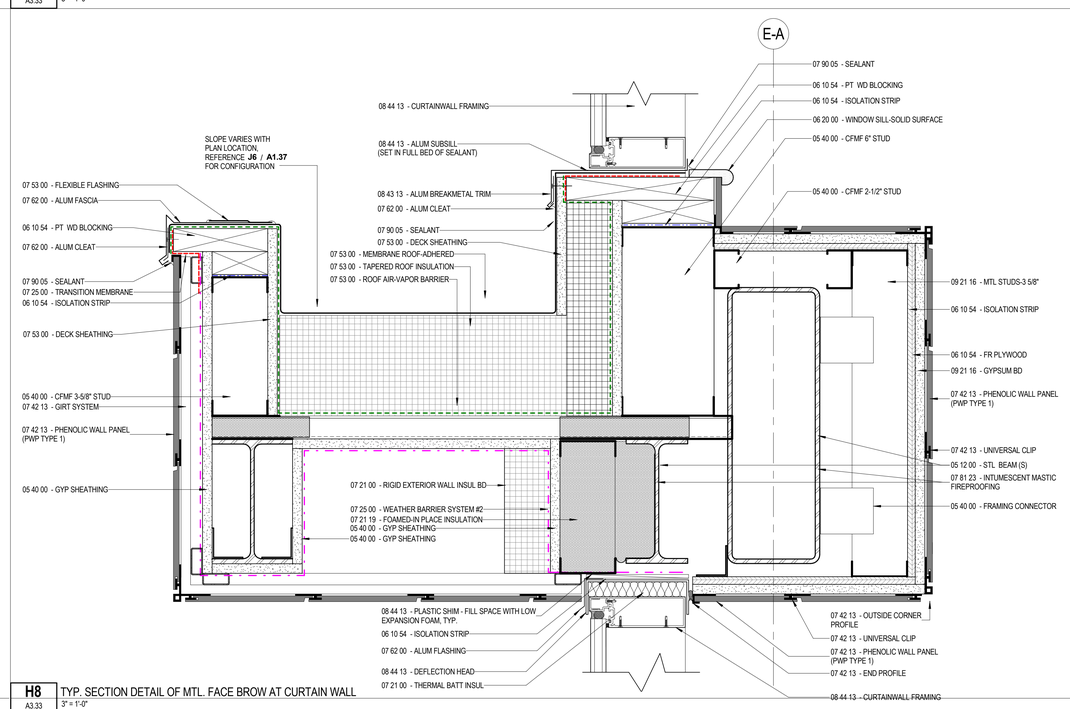
F4 A3.33 TYP. SECTION DETAIL AT MAIN ENTRY PIERS
3" = 1'-0"



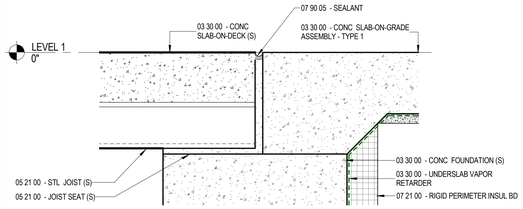
D8 A3.33 TYP. SECTION DETAIL STRUCTURAL GLAZED CURTAIN WALL AT ROOF AND EGRESS STAIR
3" = 1'-0"



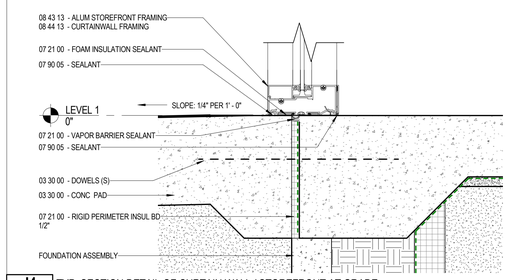
H4 A3.33 TYP. SECTION DETAIL AT ENTRY PIERS
3" = 1'-0"



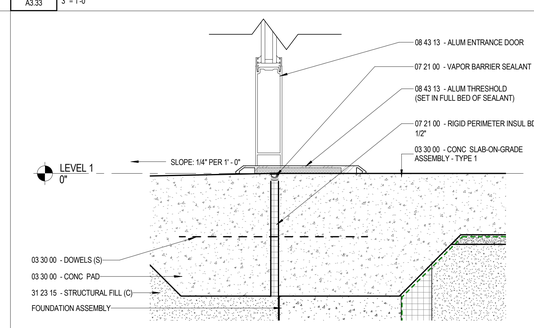
H8 A3.33 TYP. SECTION DETAIL OF MTL. FACE BROW AT CURTAIN WALL
3" = 1'-0"



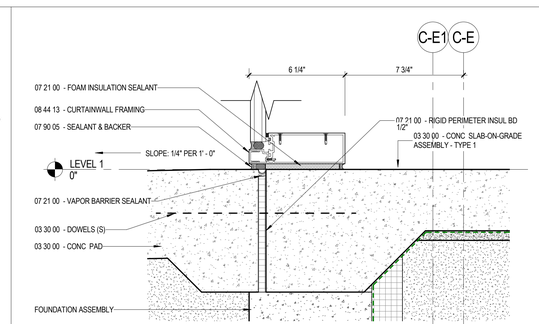
J1 A3.33 SECTION DETAIL AT BASEMENT FOUNDATION WALL
3" = 1'-0"



J4 A3.33 TYP. SECTION DETAIL OF CURTAIN WALL / STOREFRONT AT GRADE
3" = 1'-0"



J8 A3.33 SECTION DETAIL OF CURTAIN / STOREFRONT WALL DOOR AT GRADE
3" = 1'-0"



J11 A3.33 TYP. SECTION DETAIL OF STRUCTURAL GLAZED CURTAIN WALL AT GRADE
3" = 1'-0"

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SCALE:	3" = 1'-0"

A3.33

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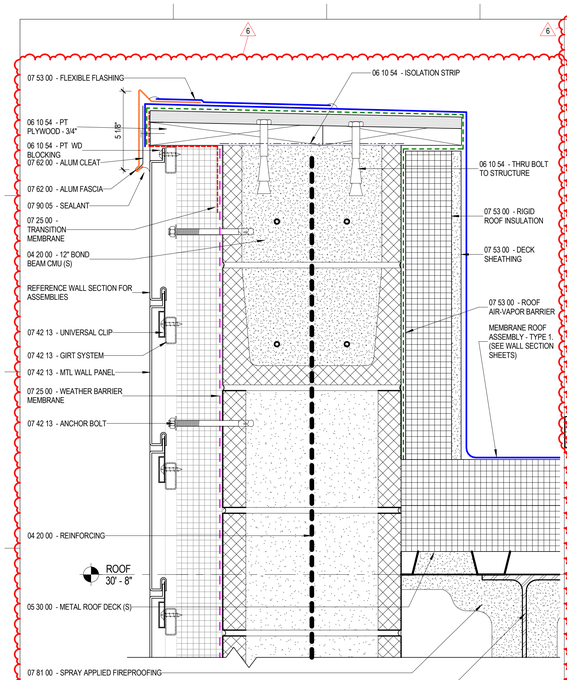
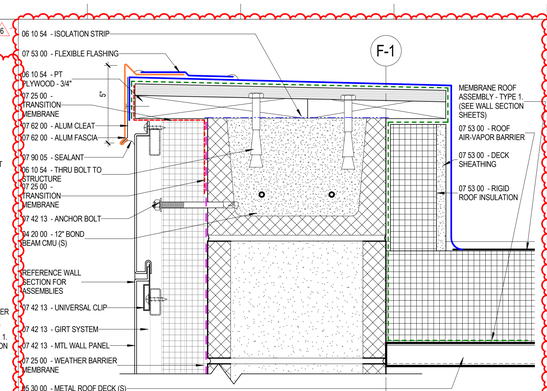
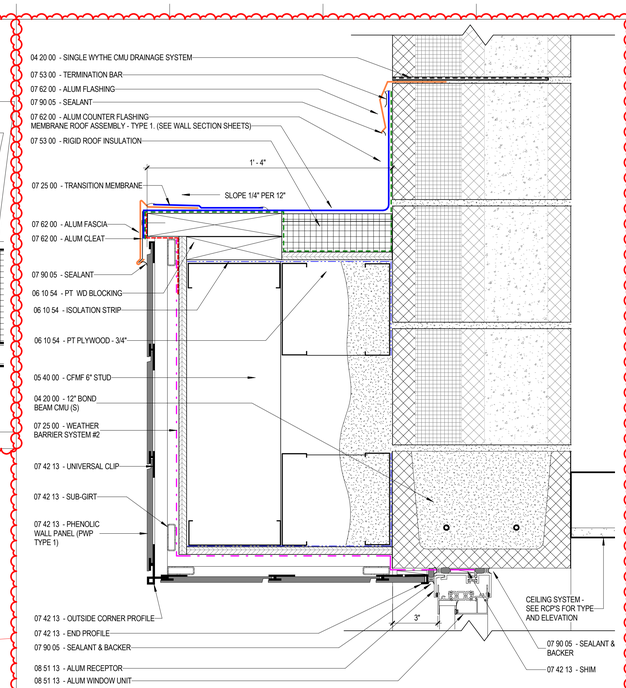


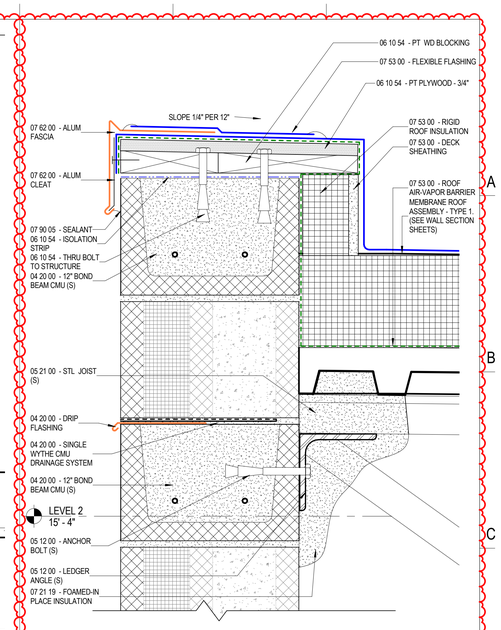
D1 A3.34 — SECTION DETAIL OF MTL FACE WITH CMU BACKUP AT PARAPET
3" = 1'-0"



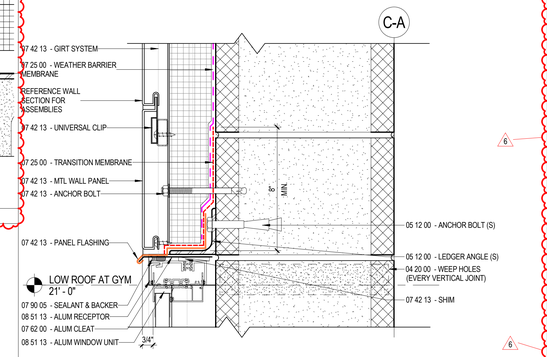
C4 A3.34 — MTL PANEL ON CMU BACKUP
3" = 1'-0"



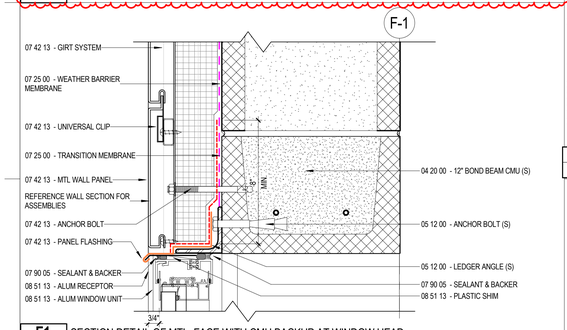
D8 A3.34 — SECTION DETAIL OF INSULATED BLOCK WALL AT WINDOW HEAD AND OVERHANG
3" = 1'-0"



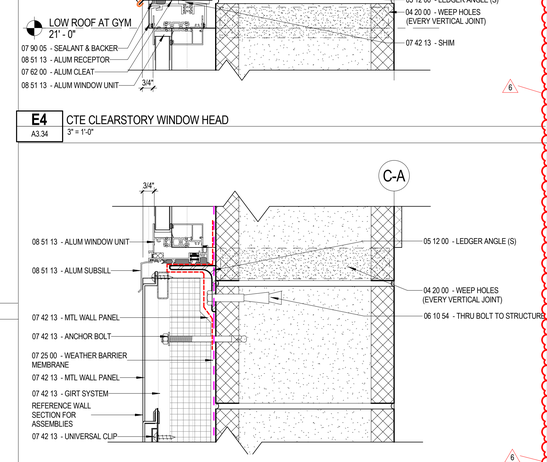
D12 A3.34 — SECTION DETAIL OF INSULATED BLOCK WALL AT ROOF
3" = 1'-0"



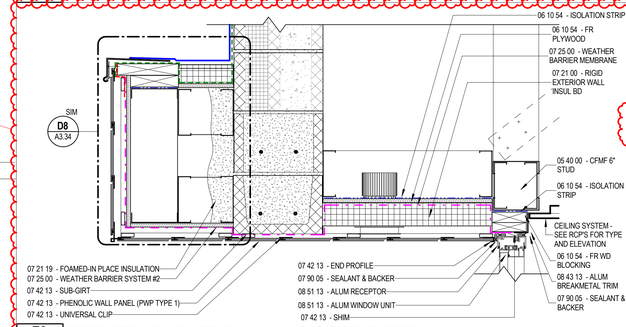
E4 A3.34 — CTE CLEARSTORY WINDOW HEAD
3" = 1'-0"



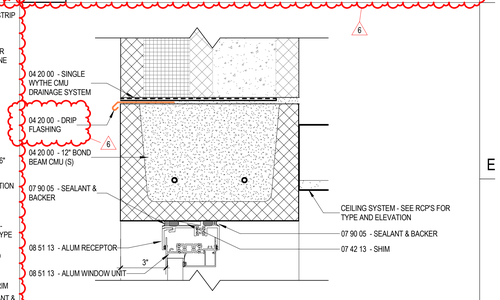
F1 A3.34 — SECTION DETAIL OF MTL. FACE WITH CMU BACKUP AT WINDOW HEAD
3" = 1'-0"



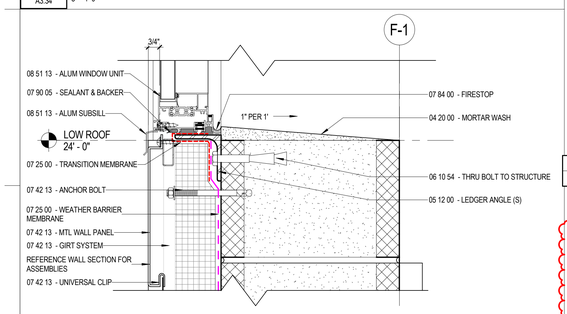
G4 A3.34 — CTE CLEARSTORY WINDOW BASE
3" = 1'-0"



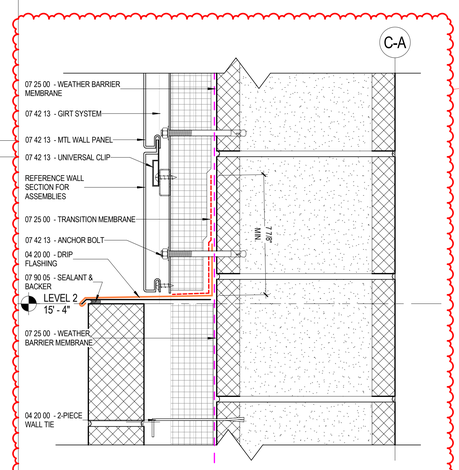
F8 A3.34 — SECTION DETAIL OF INSULATED BLOCK WALL AND STOREFRONT AT BROW
1 1/2" = 1'-0"



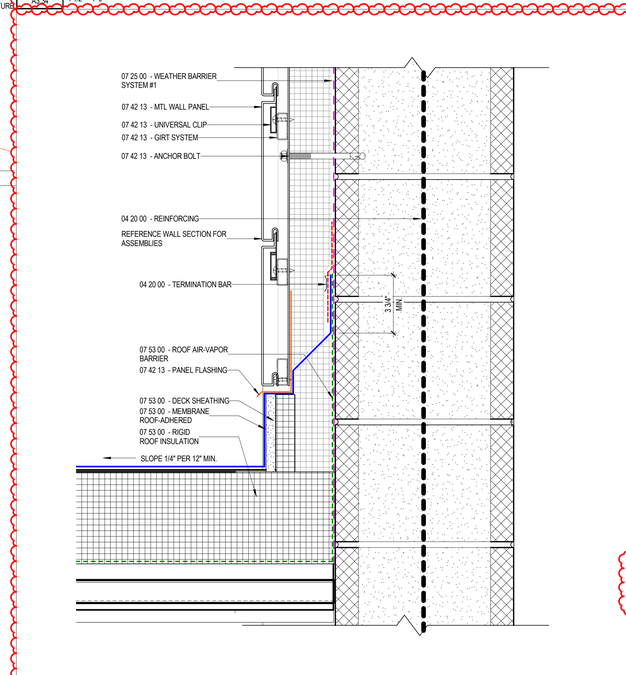
F12 A3.34 — SECTION DETAIL OF INSULATED BLOCK WALL AT WINDOW HEAD
3" = 1'-0"



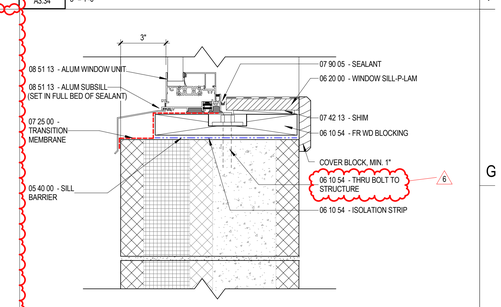
H1 A3.34 — SECTION DETAIL OF MTL. FACE WITH CMU BACKUP AT WINDOW SILL
3" = 1'-0"



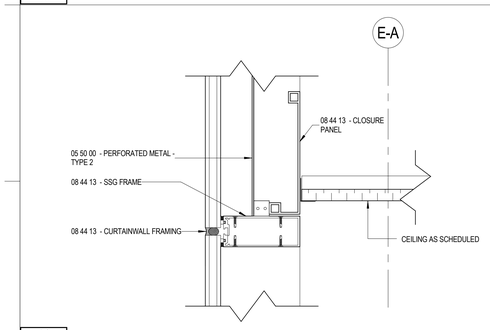
J4 A3.34 — SECTION DETAIL OF MTL. FACE ABOVE MASONRY FACE WITH CMU BACKUP
3" = 1'-0"



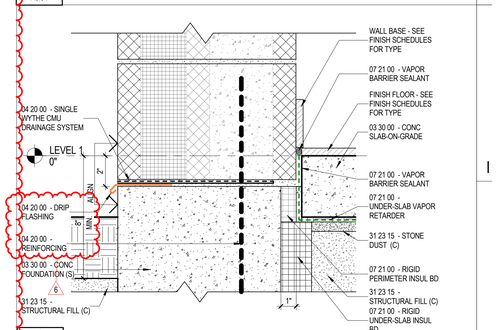
J8 A3.34 — SECTION DETAIL OF MTL. FACE WITH CMU BACKUP AT INSIDE ROOF CORNER
3" = 1'-0"



H12 A3.34 — SECTION DETAIL OF INSULATED BLOCK WALL AT WINDOW SILL
3" = 1'-0"



J1 A3.34 — TYP. WALL SECTION DETAIL AT CURTAIN WALL W/ CLOSURE PANEL
3" = 1'-0"



J12 A3.34 — SECTION DETAIL OF INSULATED BLOCK WALL AT FOUNDATION
3" = 1'-0"

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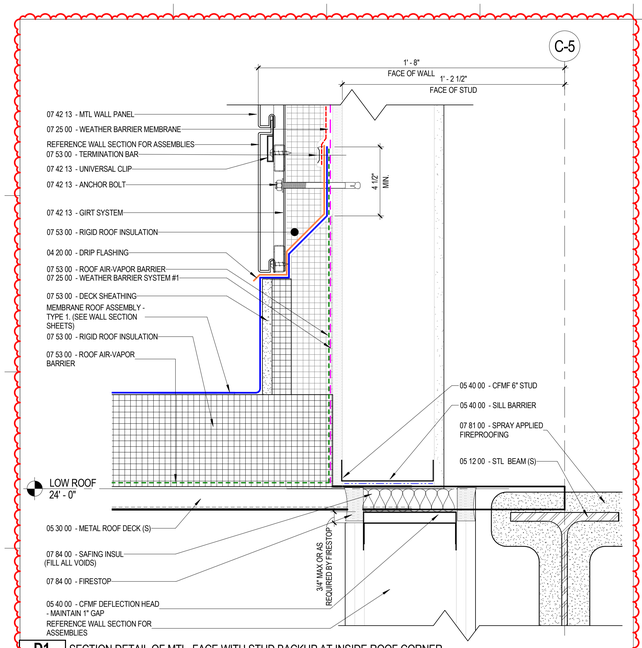
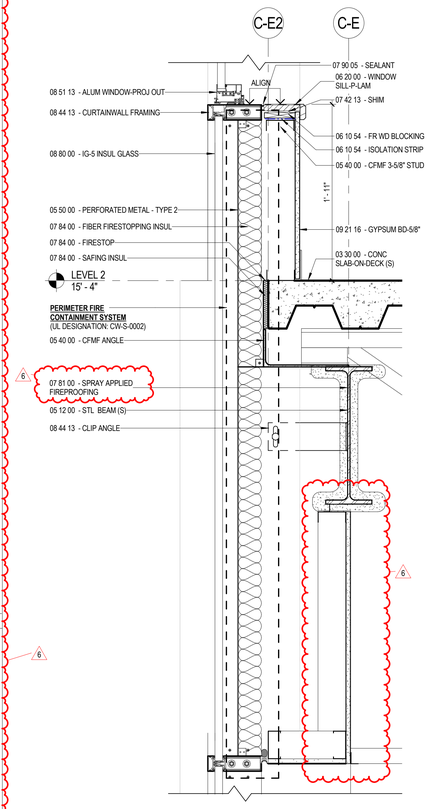
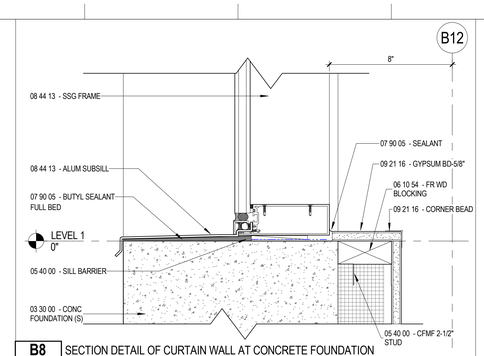


D1 A3.35 SECTION DETAIL OF MTL. FACE WITH STUD BACKUP AT INSIDE ROOF CORNER
3" = 1'-0"

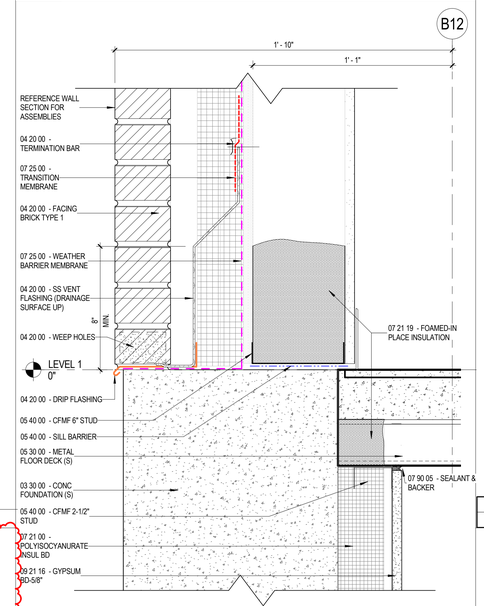
SEE DETAIL J9/A3.40



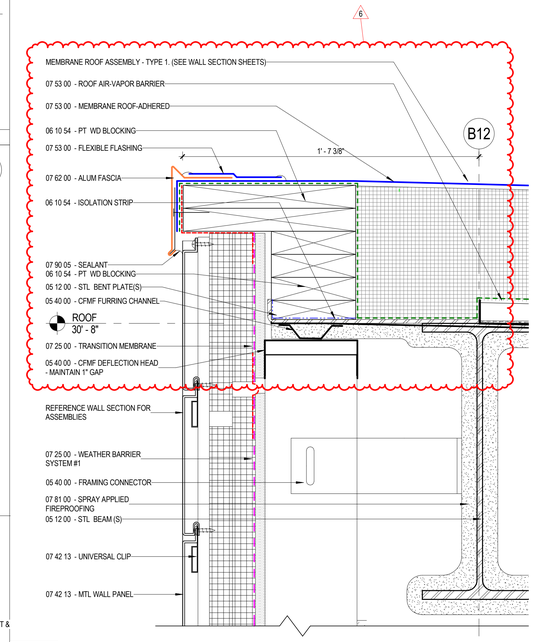
E5 A3.35 SECTION DETAIL OF MTL. FACE INTERSECTION ABOVE MASONRY FACE WITH STUD BACKUP
1 1/2" = 1'-0"



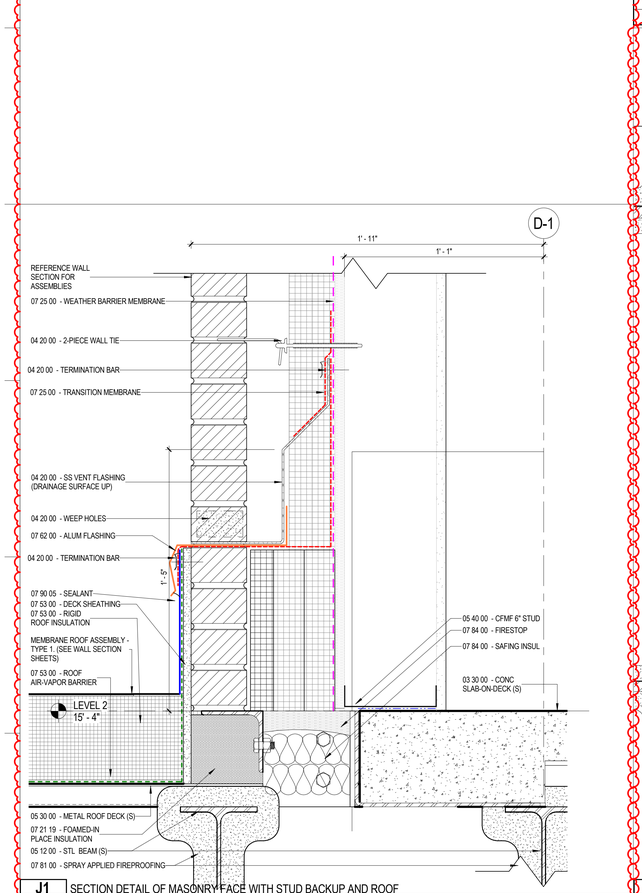
B8 A3.35 SECTION DETAIL OF CURTAIN WALL AT CONCRETE FOUNDATION
3" = 1'-0"



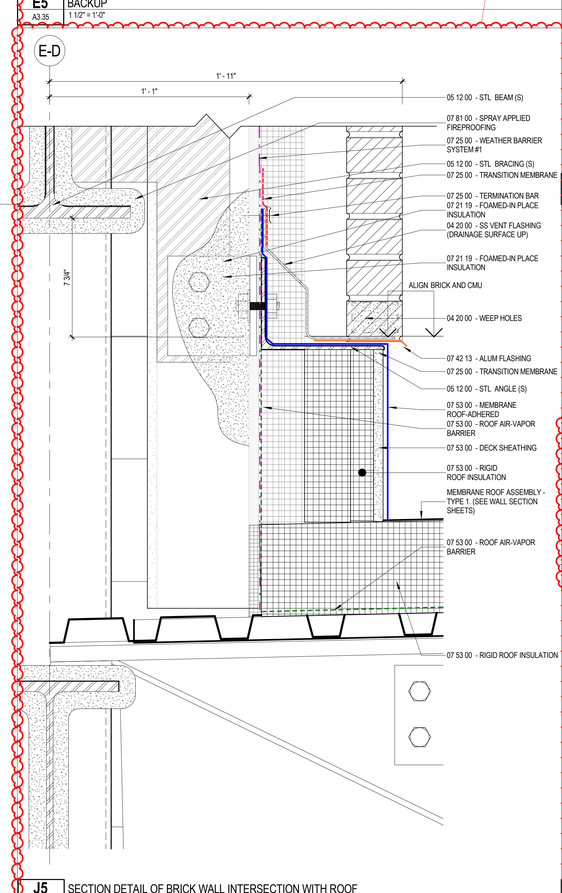
F8 A3.35 SECTION DETAIL OF MASONRY FACE WITH STUD BACKUP AT CONCRETE FOUNDATION
3" = 1'-0"



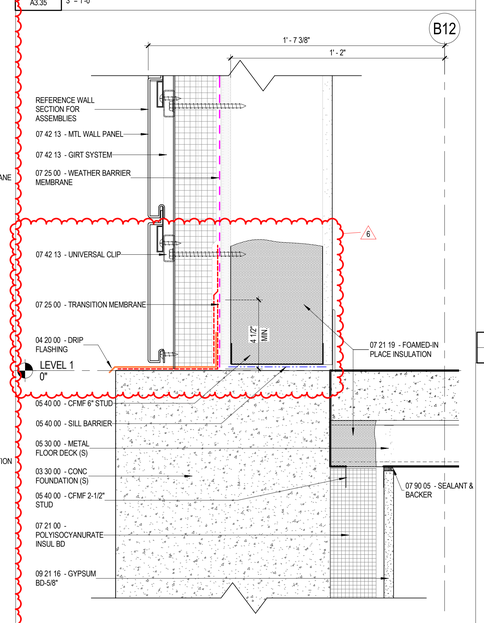
E11 A3.35 TYP. SECTION DETAIL OF MTL. FACE WITH STUD BACKUP AT ROOF
3" = 1'-0"



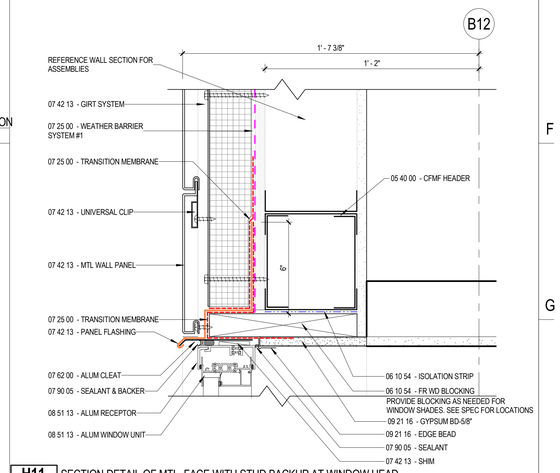
J1 A3.35 SECTION DETAIL OF MASONRY FACE WITH STUD BACKUP AND ROOF
3" = 1'-0"



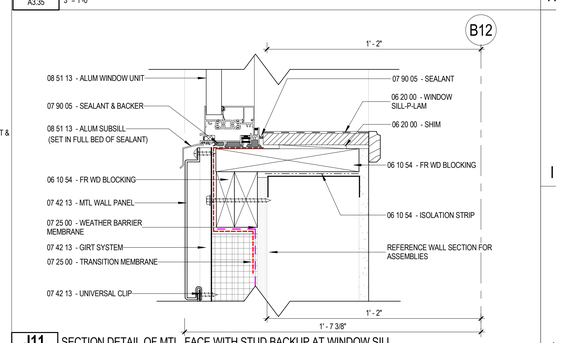
J5 A3.35 SECTION DETAIL OF BRICK WALL INTERSECTION WITH ROOF
3" = 1'-0"



J8 A3.35 SECTION DETAIL OF MTL. WALL INTERSECTION WITH CONCRETE FOUNDATION
3" = 1'-0"



H11 A3.35 SECTION DETAIL OF MTL. FACE WITH STUD BACKUP AT WINDOW HEAD
3" = 1'-0"



J11 A3.35 SECTION DETAIL OF MTL. FACE WITH STUD BACKUP AT WINDOW SILL
3" = 1'-0"

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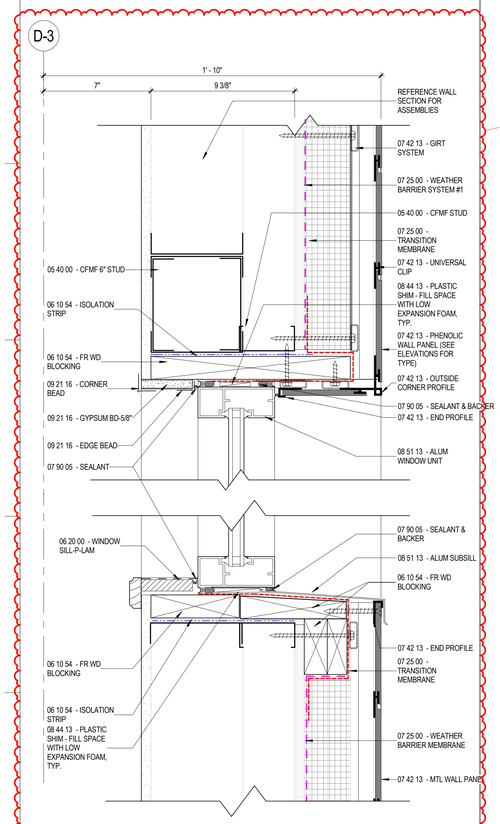
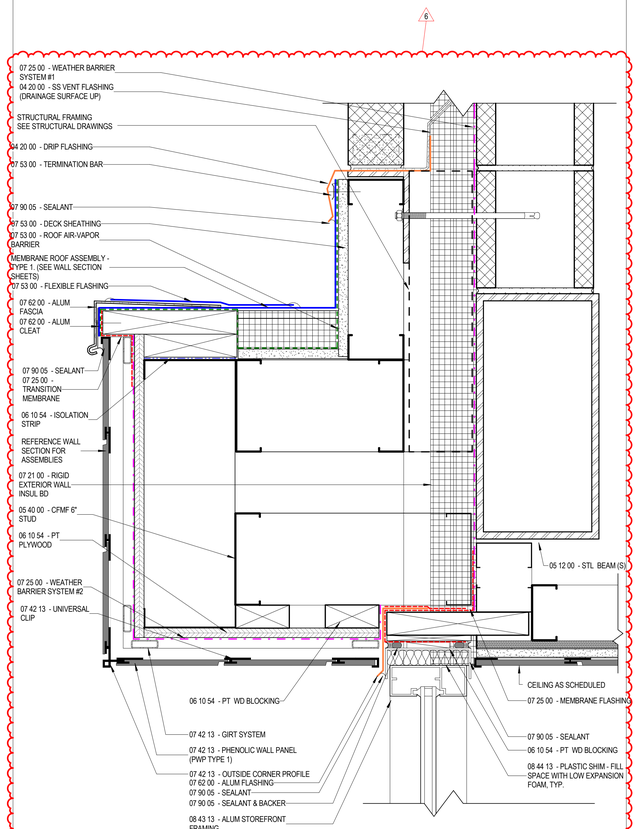
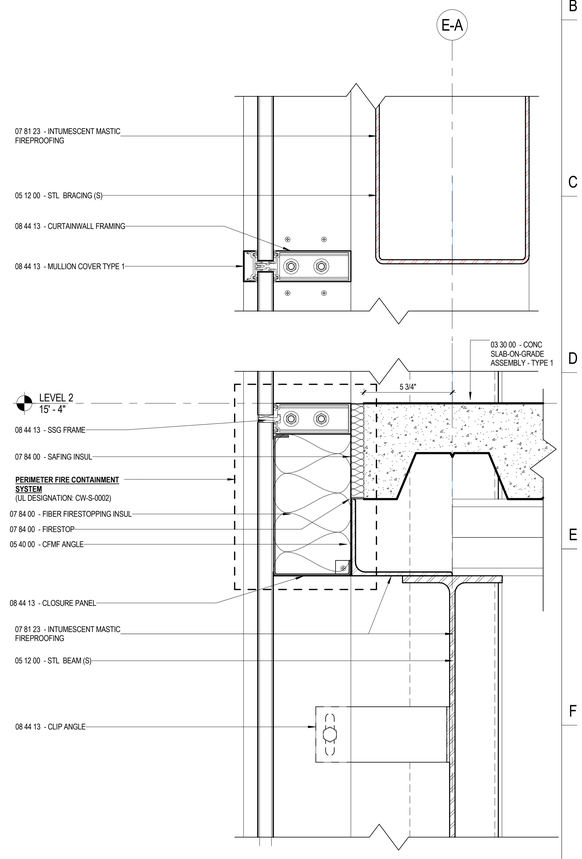


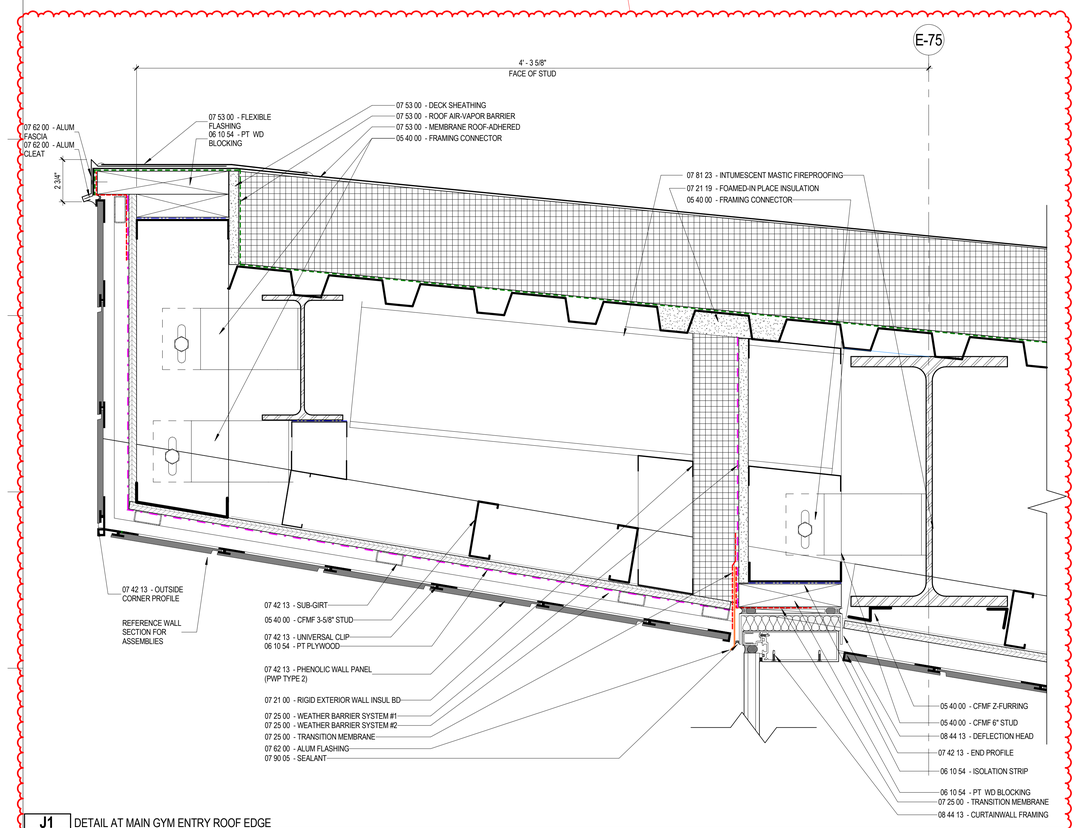
E1 A3.36 SECTION DETAIL - COMPOSITE PANEL ON STUD BACKUP
3" = 1'-0"



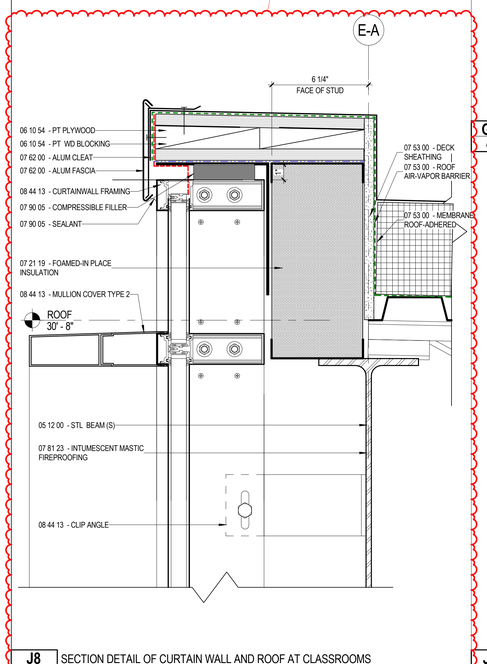
E7 A3.36 SECTION DETAIL OF BROW AND CURTAIN WALL AT DINING ENTRY
3" = 1'-0"



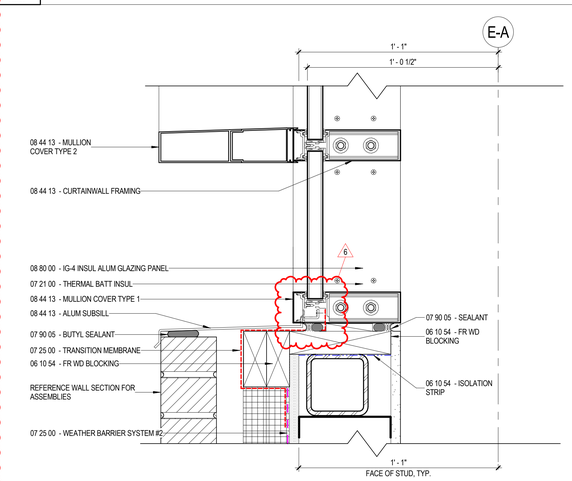
G11 A3.36 SECTION DETAIL OF CURTAIN WALL AND 2ND FL. SLAB AT CLASSROOMS
3" = 1'-0"



J1 A3.36 DETAIL AT MAIN GYM ENTRY ROOF EDGE
3" = 1'-0"



J8 A3.36 SECTION DETAIL OF CURTAIN WALL AND ROOF AT CLASSROOMS
3" = 1'-0"



J11 A3.36 SECTION DETAIL OF CURTAIN WALL ABOVE MASONRY FACE WITH STUD BACKUP AT CLASSROOMS
3" = 1'-0"

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6	Addendum 6	03/24/16

CONTENT:
WALL SECTION DETAILS

DRAWN BY:	EL
PROJECT NO:	12-067-00
DATE:	02/11/2016
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SCALE:	3" = 1'-0"

A3.36

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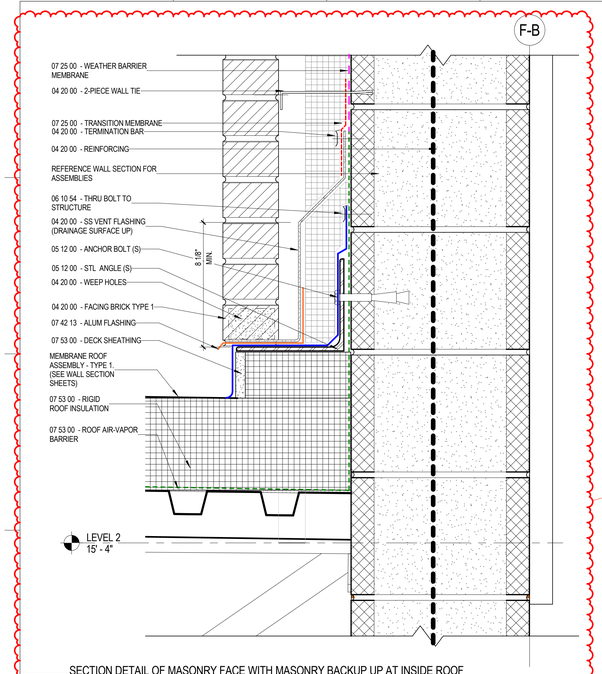
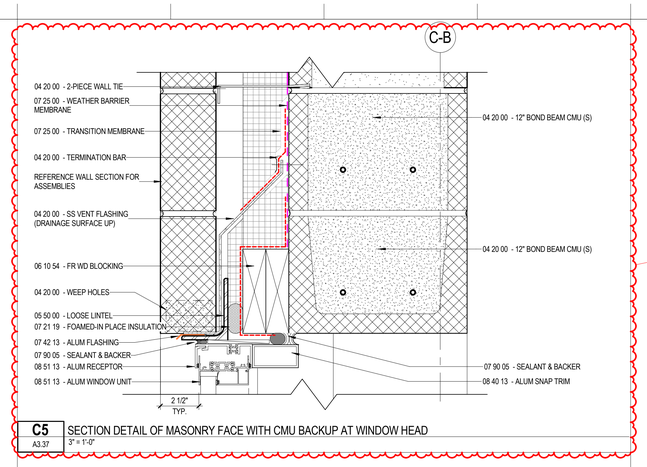
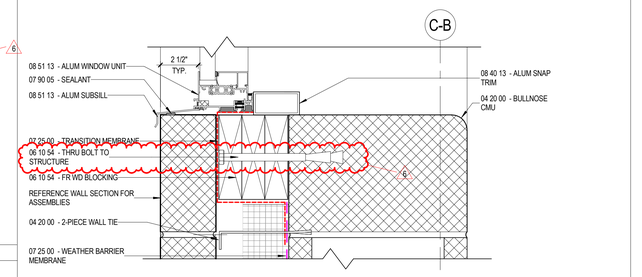


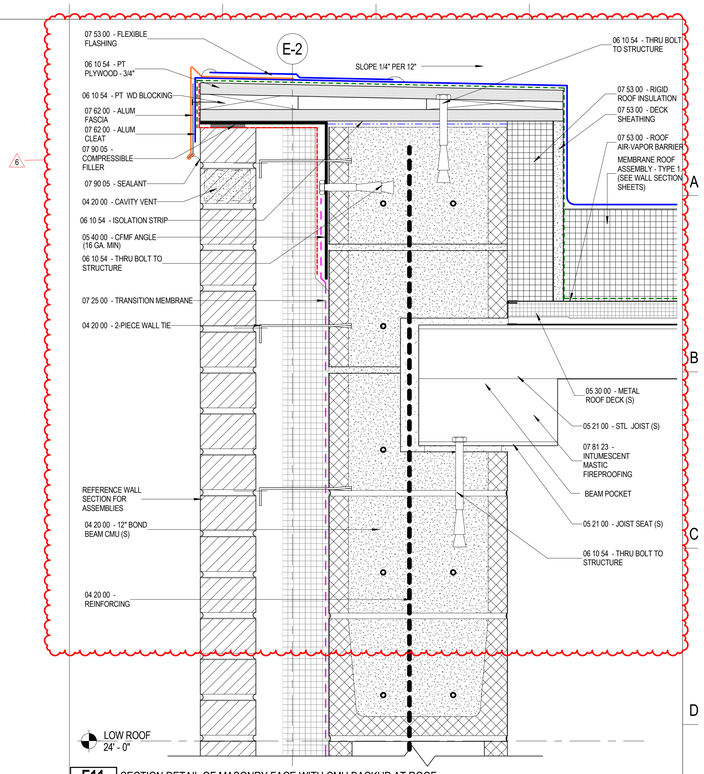
D1 A3.37 SECTION DETAIL OF MASONRY FACE WITH MASONRY BACKUP UP AT INSIDE ROOF CORNER
3" = 1'-0"



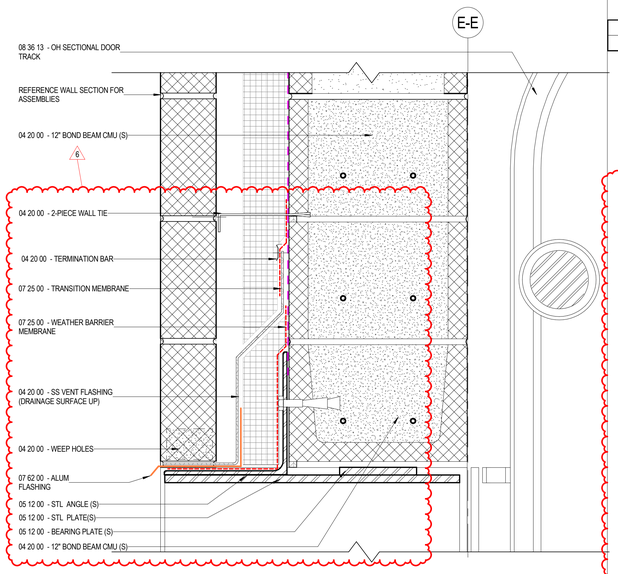
C5 A3.37 SECTION DETAIL OF MASONRY FACE WITH CMU BACKUP AT WINDOW HEAD
3" = 1'-0"



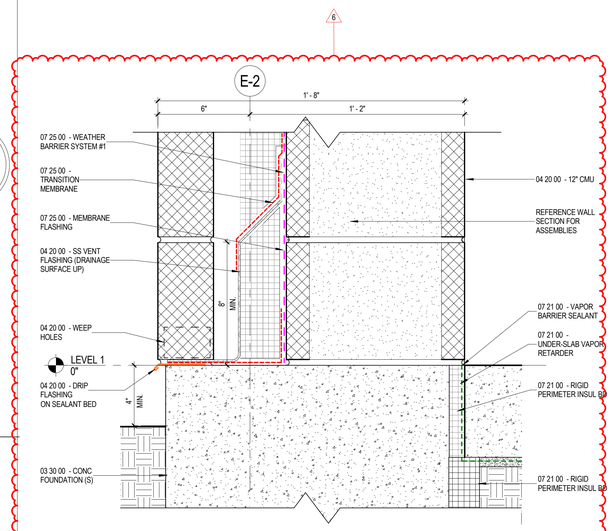
E5 A3.37 TYP. SECTION DETAIL OF MASONRY FACE WITH CMU BACKUP AT WINDOW SILL
3" = 1'-0"



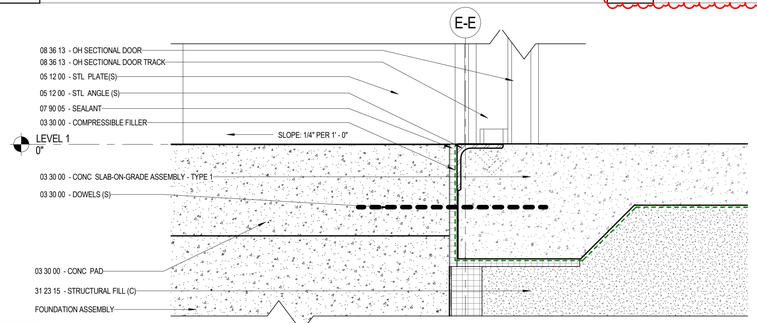
E11 A3.37 SECTION DETAIL OF MASONRY FACE WITH CMU BACKUP AT ROOF
3" = 1'-0"



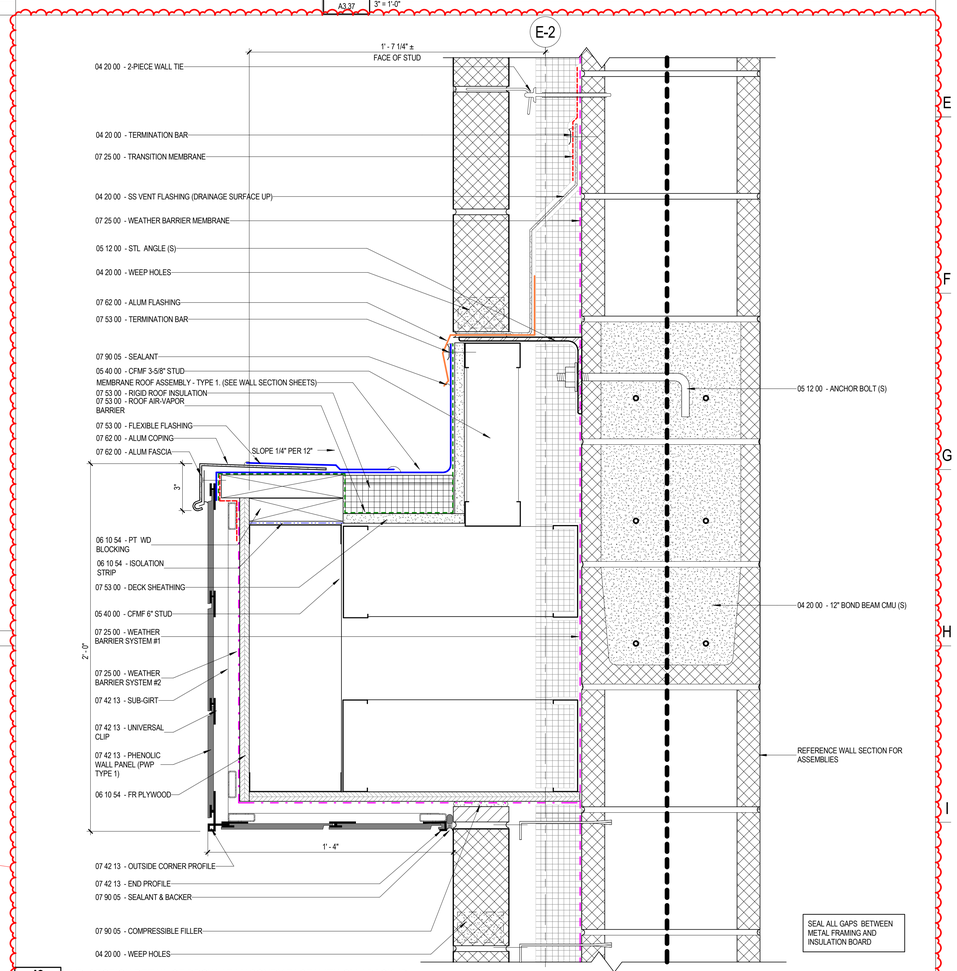
H1 A3.37 SECTION DETAIL OF OVERHEAD DOOR HEAD AT MASONRY FACE WITH CMU BACKUP
3" = 1'-0"



H5 A3.37 SECTION DETAIL OF MASONRY FACE WITH CMU BACKUP AT FOUNDATION
3" = 1'-0"



J1 A3.37 TYP. SECTION DETAIL OF GARAGE DOOR AT GRADE
3" = 1'-0"



J9 A3.37 TYP. SECTION DETAIL OF BROW AT MASONRY FACE WITH CMU BACKUP
3" = 1'-0"

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A3.37

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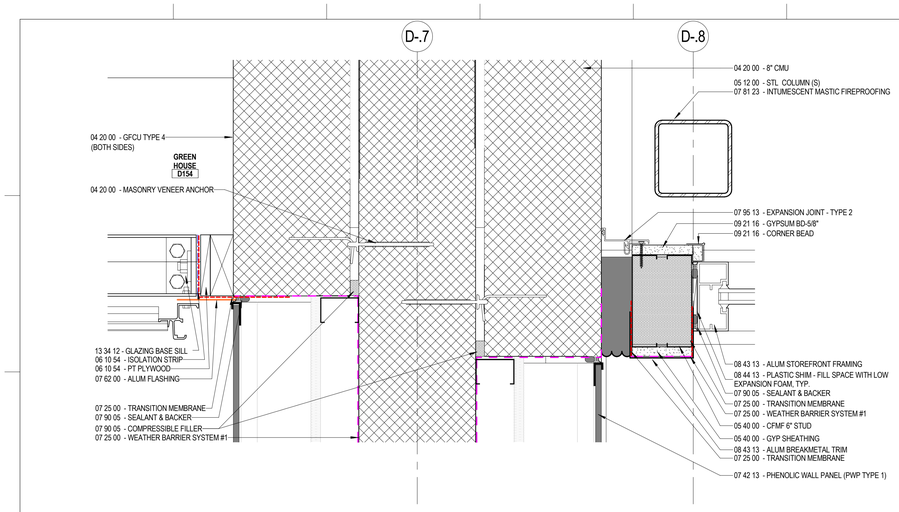
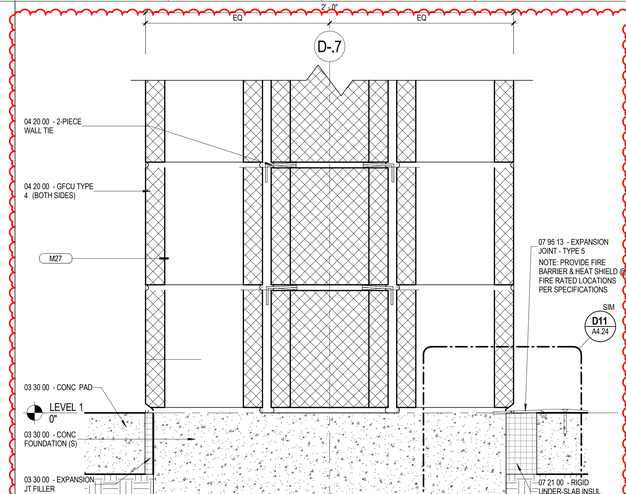
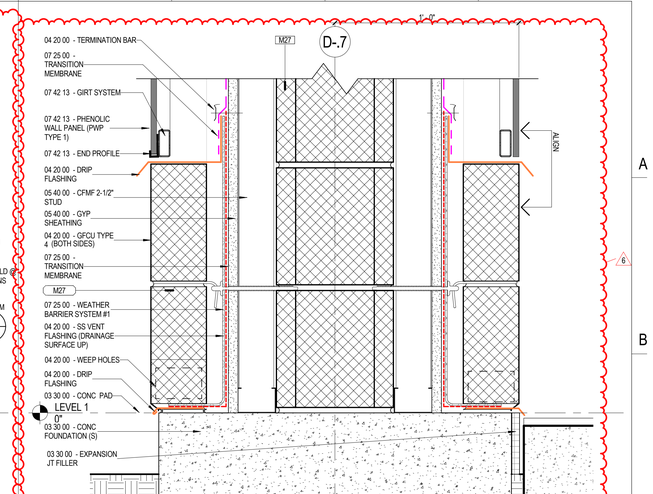


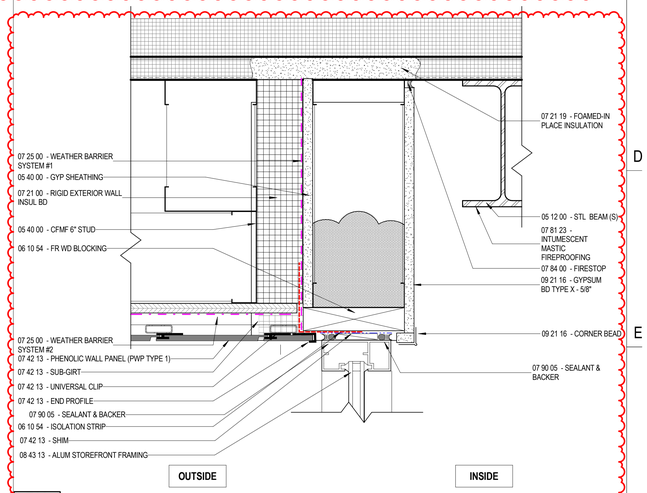
C1 A3.38 PLAN DETAIL @ GREEN HOUSE PIER ENLARGED
3" = 1'-0"



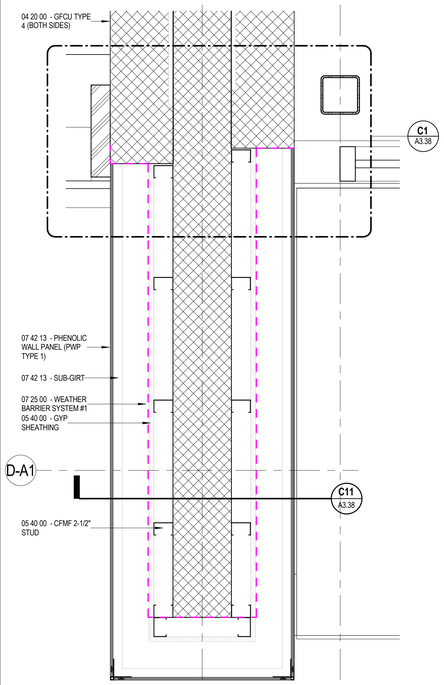
C7 A3.38 GREENHOUSE FIRE WALL SECTION 2
3" = 1'-0"



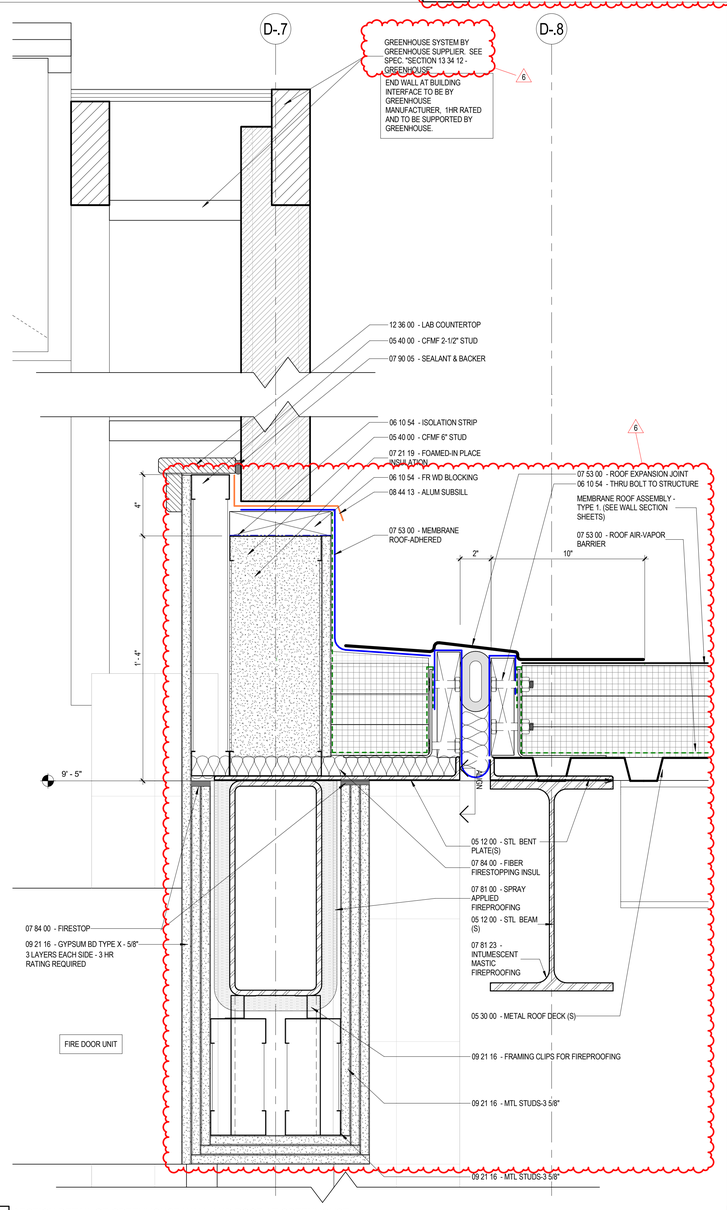
C11 A3.38 GREENHOUSE FIRE WALL SECTION 1
3" = 1'-0"



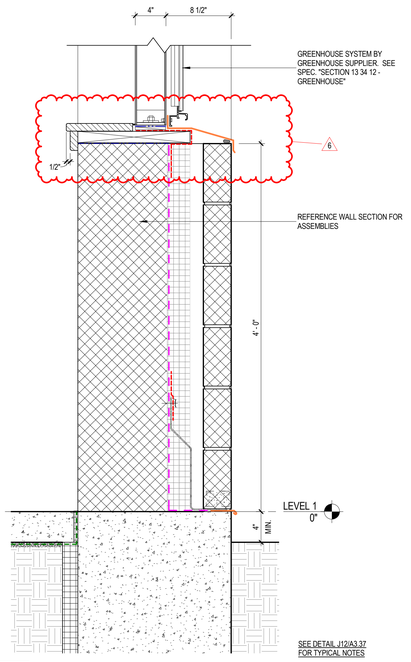
F11 A3.38 SECTION DETAIL OF BROW ABOVE STOREFRONT HEAD AT GREENHOUSE
3" = 1'-0"



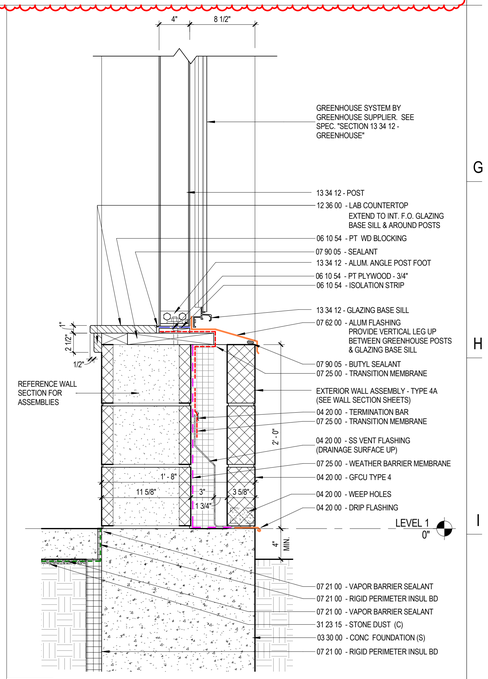
J1 A3.38 PLAN DETAIL @ GREENHOUSE PIER
1 1/2" = 1'-0"



J4 A3.38 SECTION DETAIL OF GREENHOUSE WALL AND ROOF AT GREENHOUSE
3" = 1'-0"



J9 A3.38 SECTION DETAIL THROUGH GREENHOUSE BASE
1 1/2" = 1'-0"



J12 A3.38 SECTION DETAIL OF GREENHOUSE BASE WALL AND GREENHOUSE AT EVE SIDE
1 1/2" = 1'-0"

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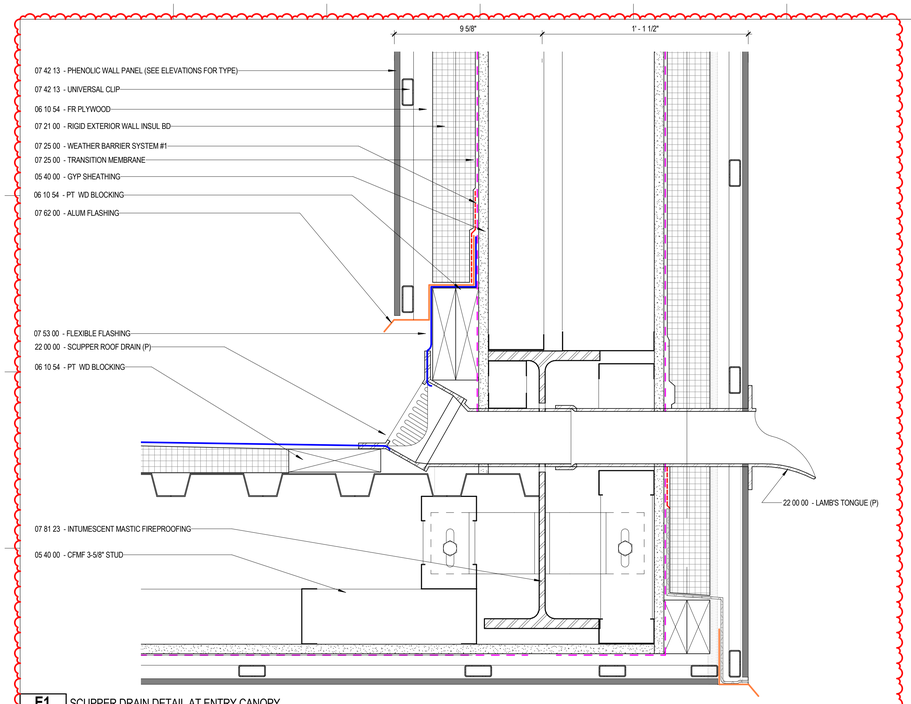
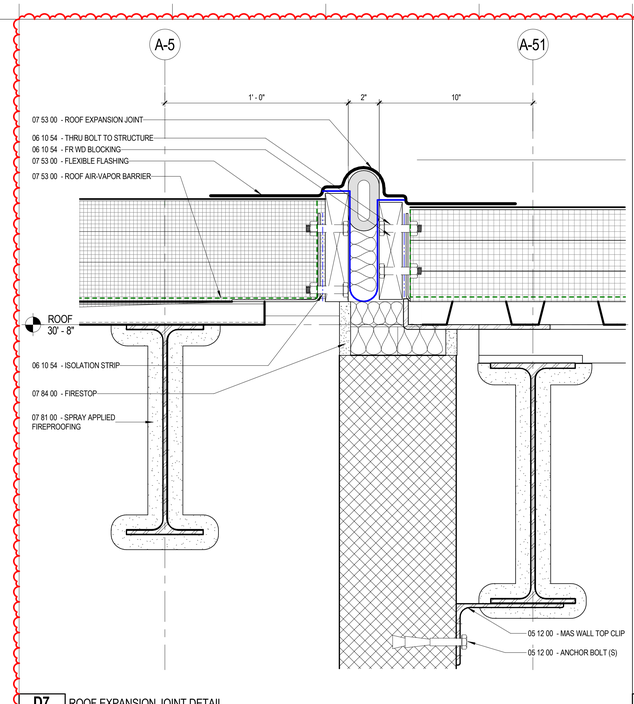
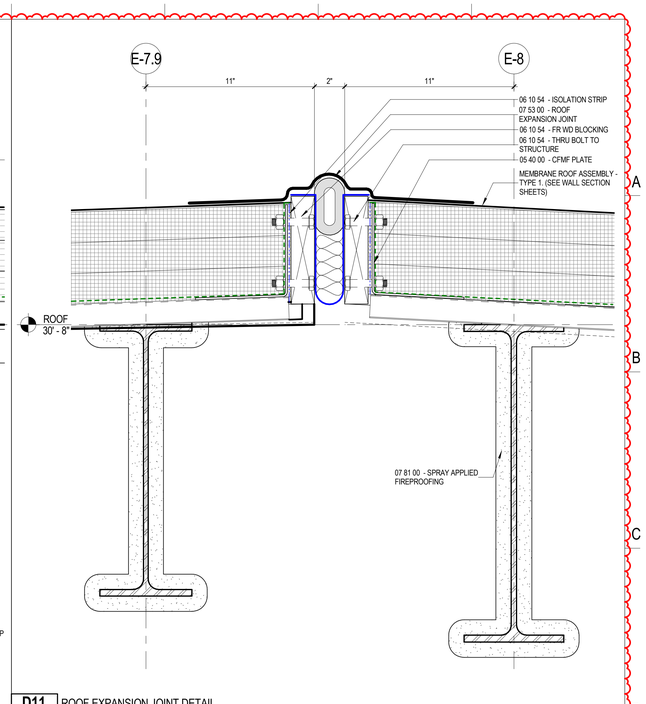


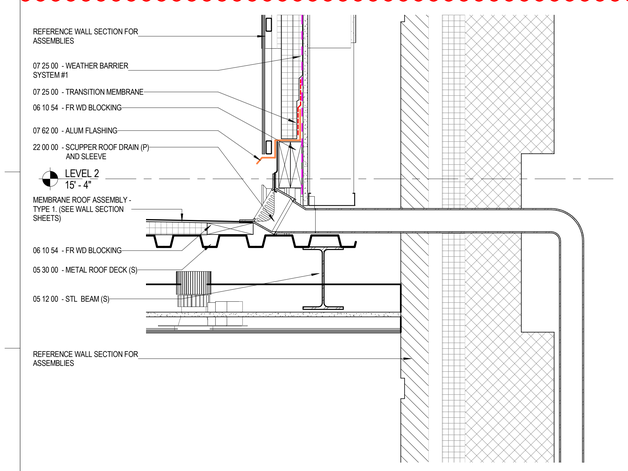
E1 A3.40 SCUPPER DRAIN DETAIL AT ENTRY CANOPY
3" = 1'-0"



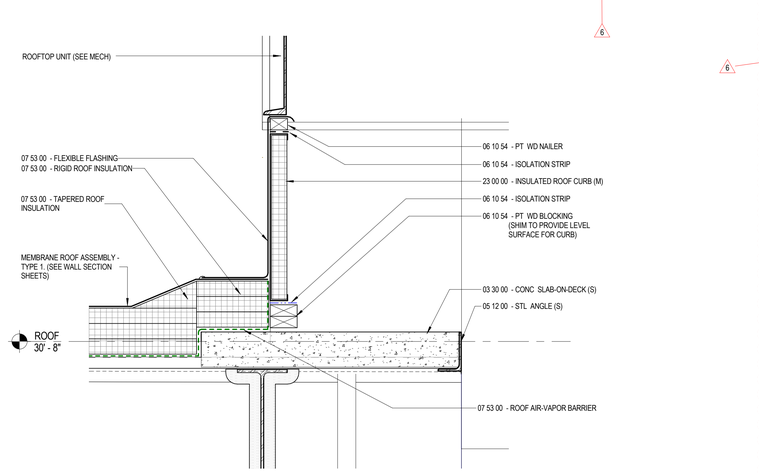
D7 A3.40 ROOF EXPANSION JOINT DETAIL.
3" = 1'-0"



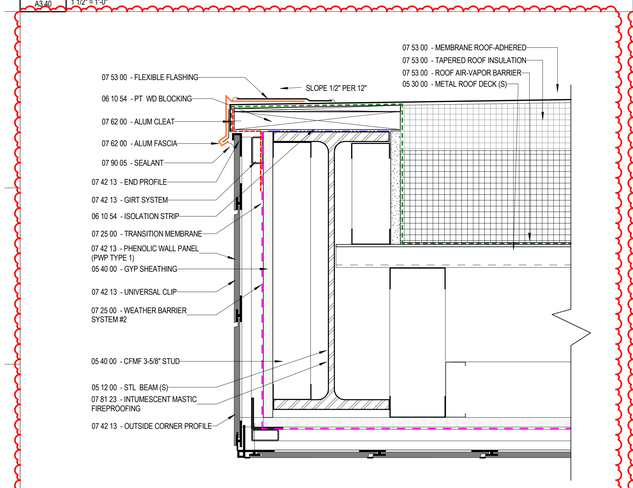
D11 A3.40 ROOF EXPANSION JOINT DETAIL
3" = 1'-0"



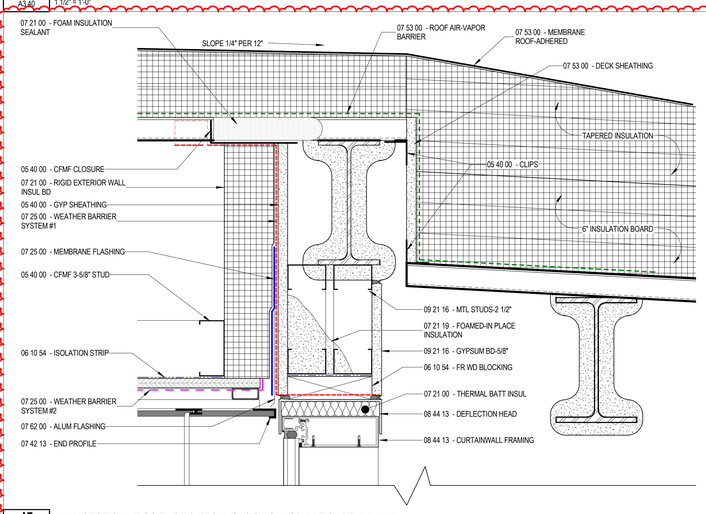
G1 A3.40 Detail 0
1 1/2" = 1'-0"



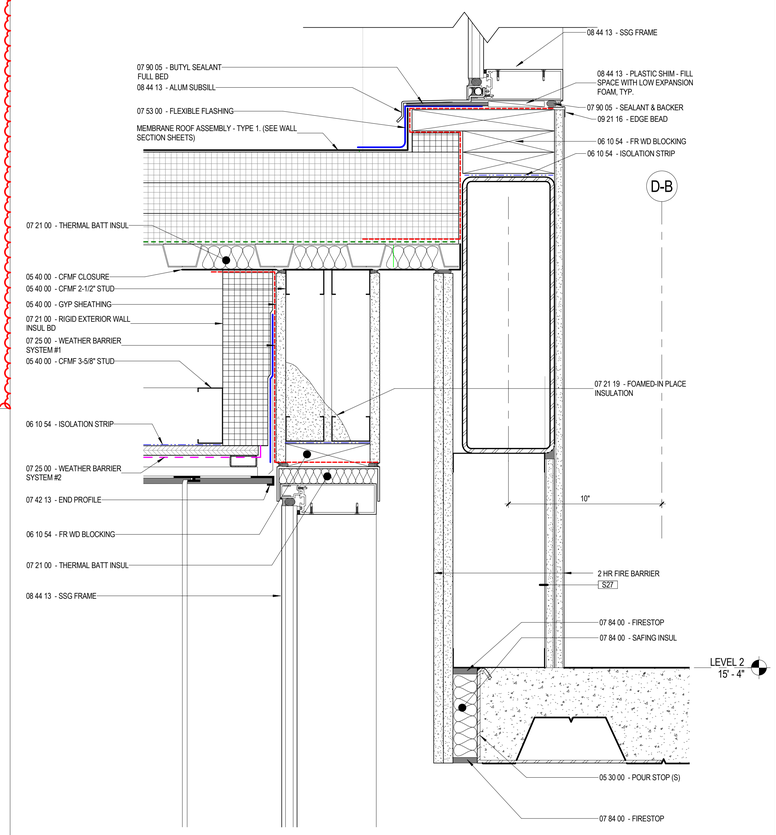
G5 A3.40 TYPICAL DETAIL AT RTU CURB AND SLAB
1 1/2" = 1'-0"



J1 A3.40 Detail 7
3" = 1'-0"



J5 A3.40 WALL SECTION AT SCIENCE & TECHNOLOGY CANOPY AT CURTAIN WALL
3" = 1'-0"



J9 A3.40 SECTION DETAIL OF BROW AND OFFSET CURTAIN WALL
3" = 1'-0"

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CONTENT:
ROOF DETAILS

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A3.40

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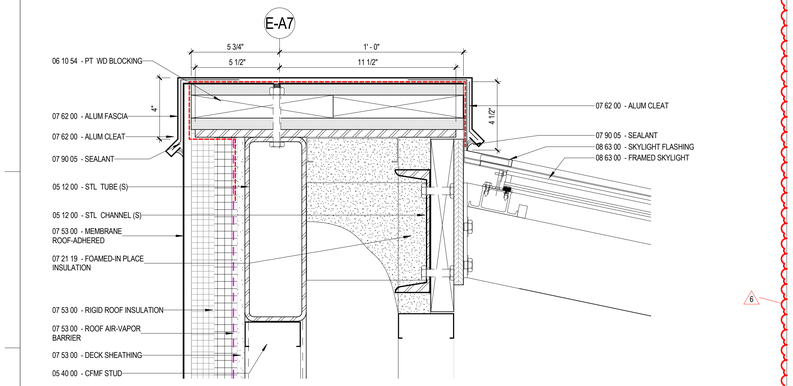
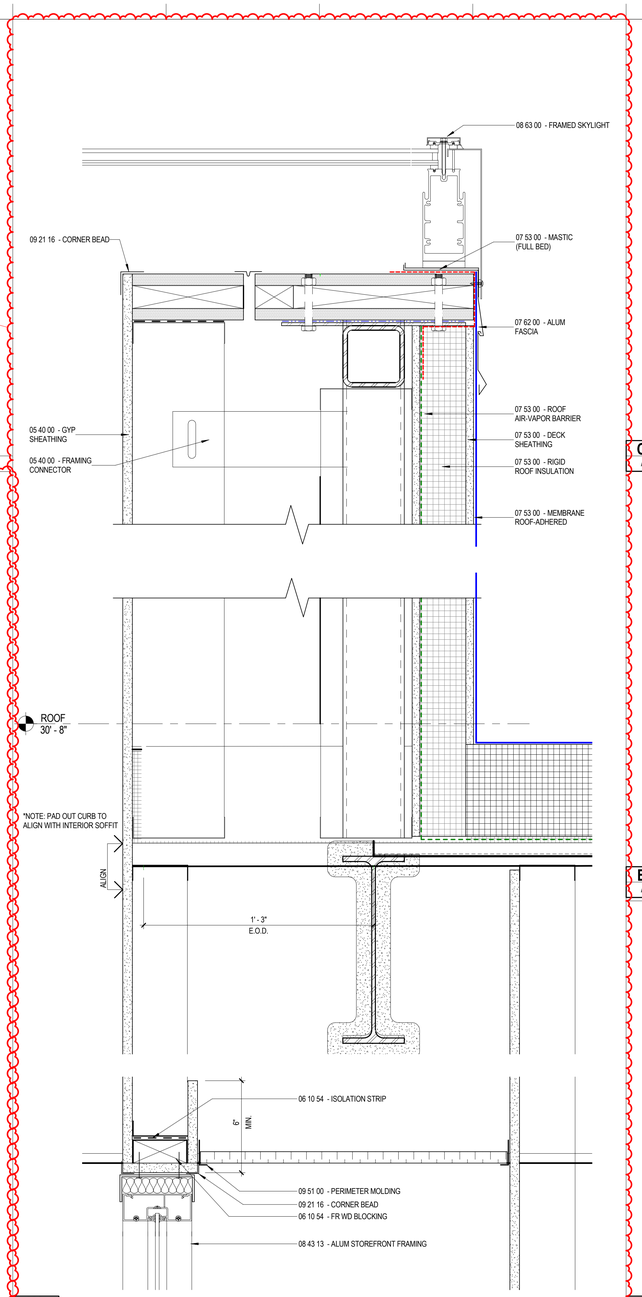
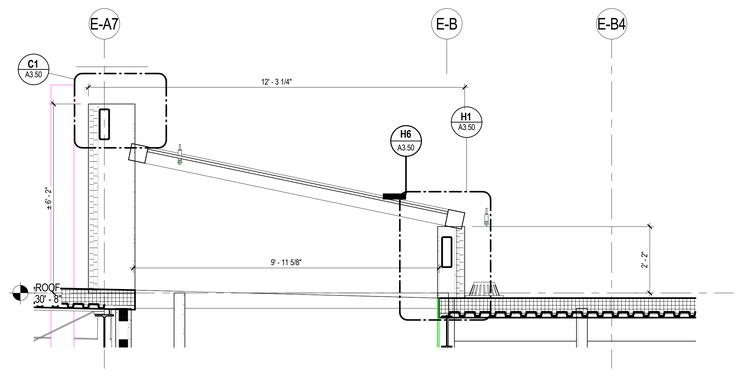


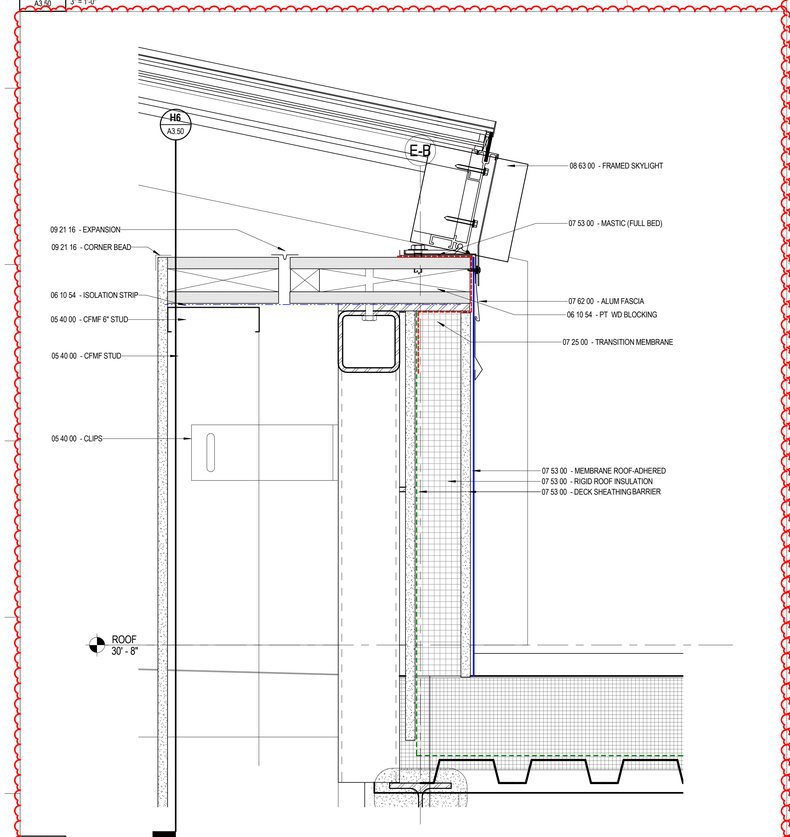
C1 A3.50 TYP. SKYLIGHT HEAD DETAIL
3" = 1'-0"



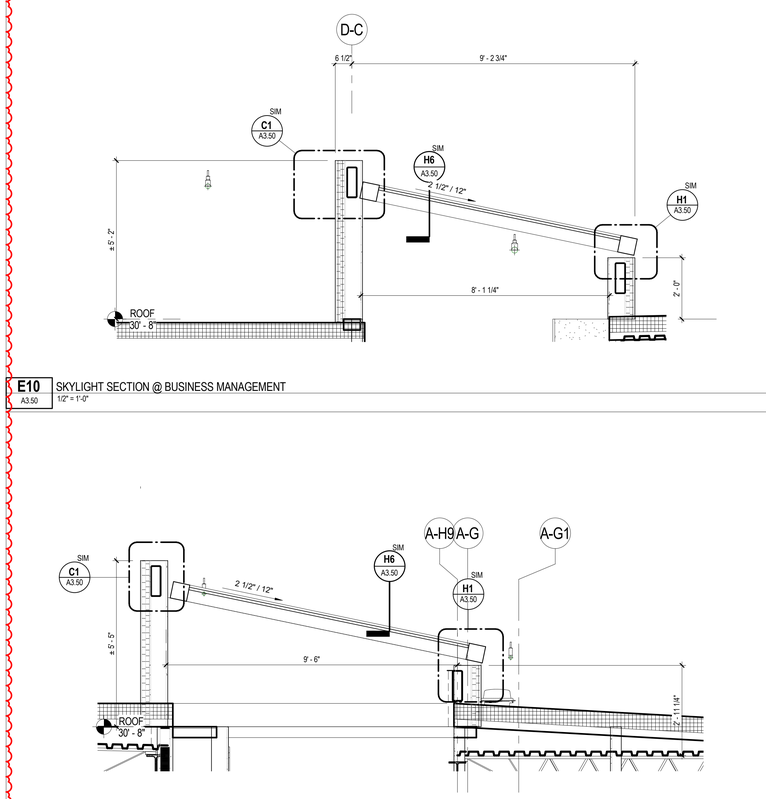
H6 A3.50 TYP. SKYLIGHT JAMB DETAIL
3" = 1'-0"



C10 A3.50 SKYLIGHT SECTION @ HEALTH & HUMAN SERVICES
1/2" = 1'-0"

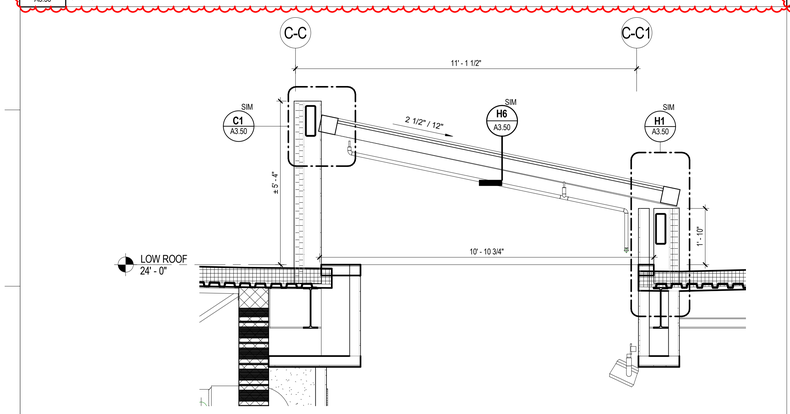


H1 A3.50 TYP. SKYLIGHT SILL DETAIL
3" = 1'-0"

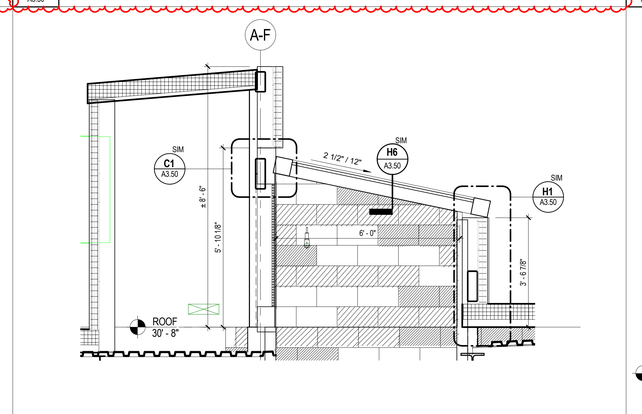


E10 A3.50 SKYLIGHT SECTION @ BUSINESS MANAGEMENT
1/2" = 1'-0"

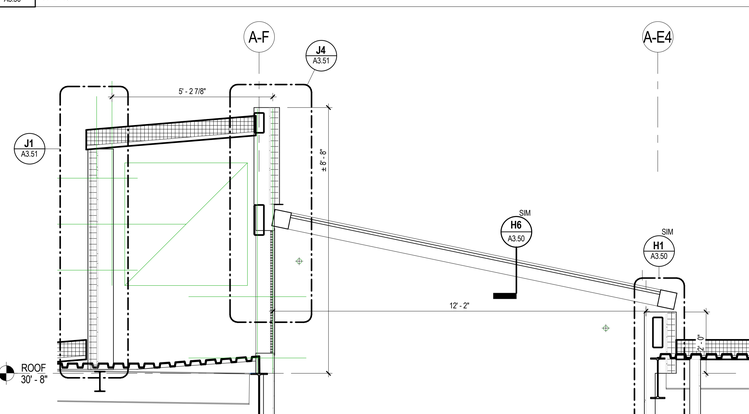
H10 A3.50 SKYLIGHT SECTION @ ARTS & COMMUNICATION
1/2" = 1'-0"



J1 A3.50 SKYLIGHT SECTION @ SCIENCE AND TECHNOLOGY
1/2" = 1'-0"



J6 A3.50 SKYLIGHT SECTION @ AGORA STAIRS
1/2" = 1'-0"



J10 A3.50 SKYLIGHT SECTION @ CENTRAL SPINE
1/2" = 1'-0"

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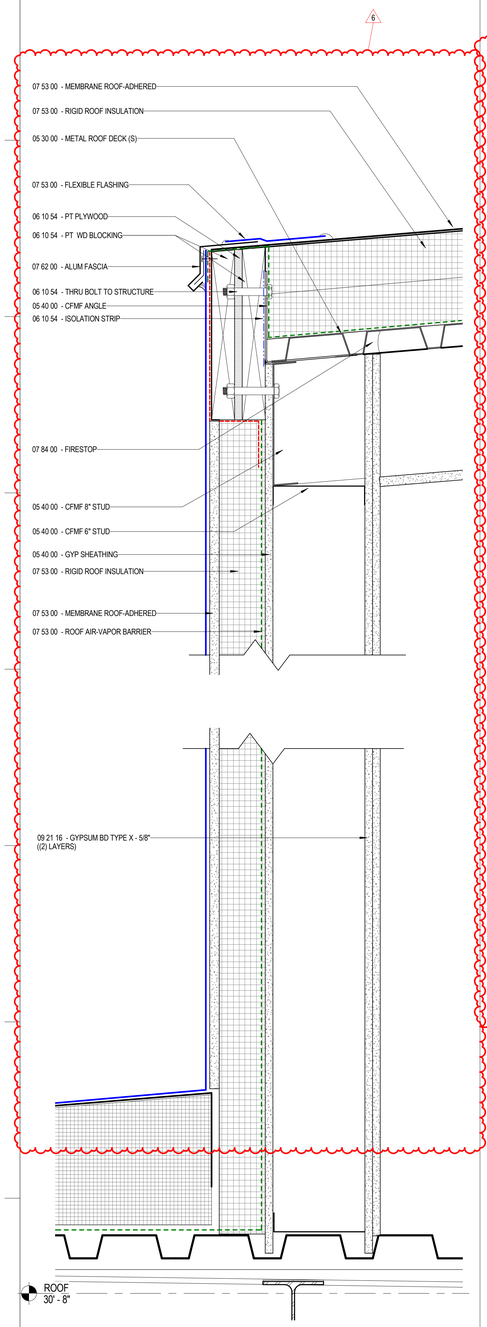
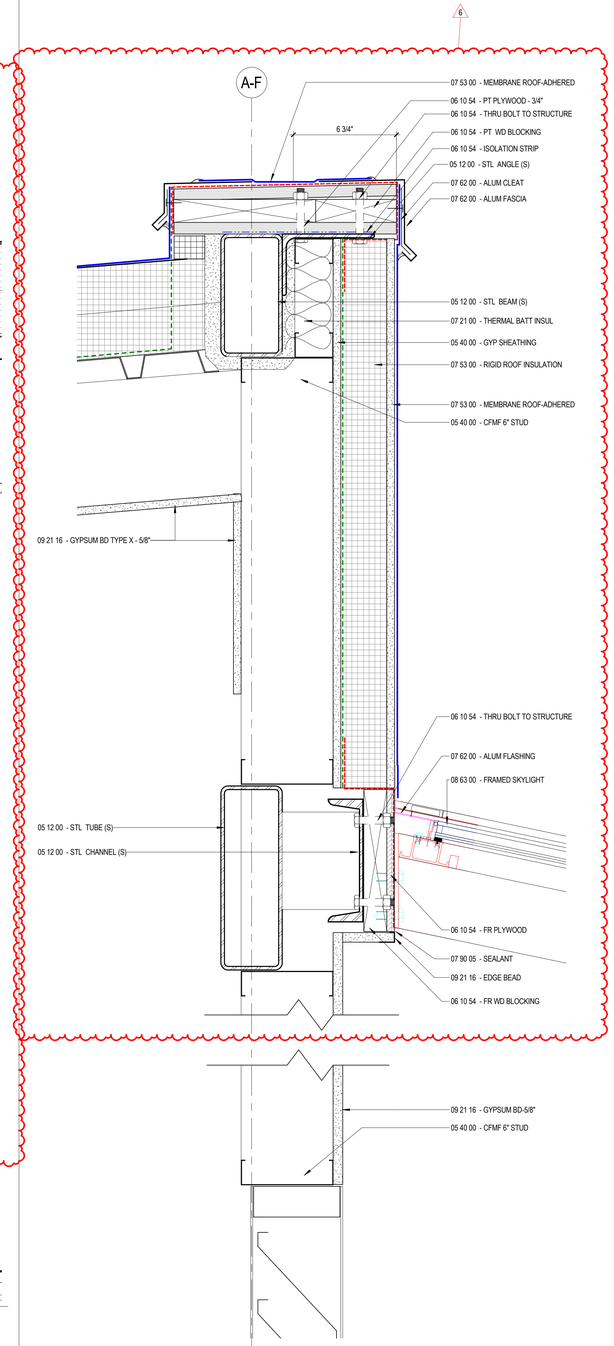


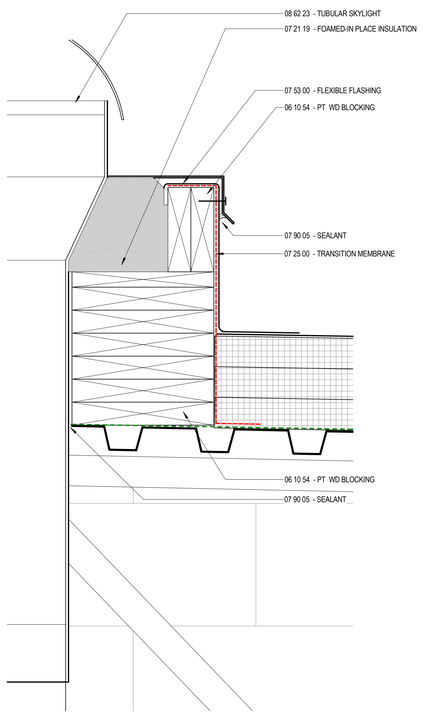
J1 A3.51 Detail 5
3" = 1'-0"



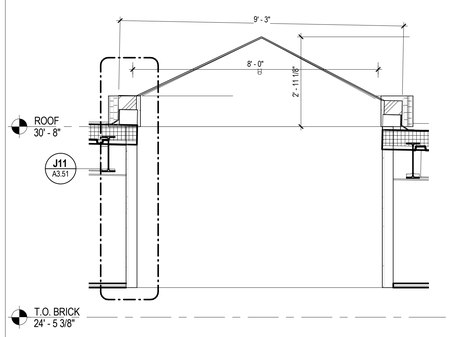
J4 A3.51 SKYLIGHT SECTION @ CENTRAL SPINE - Callout 1
3" = 1'-0"

SEE DETAIL J4/A3.51 SIM

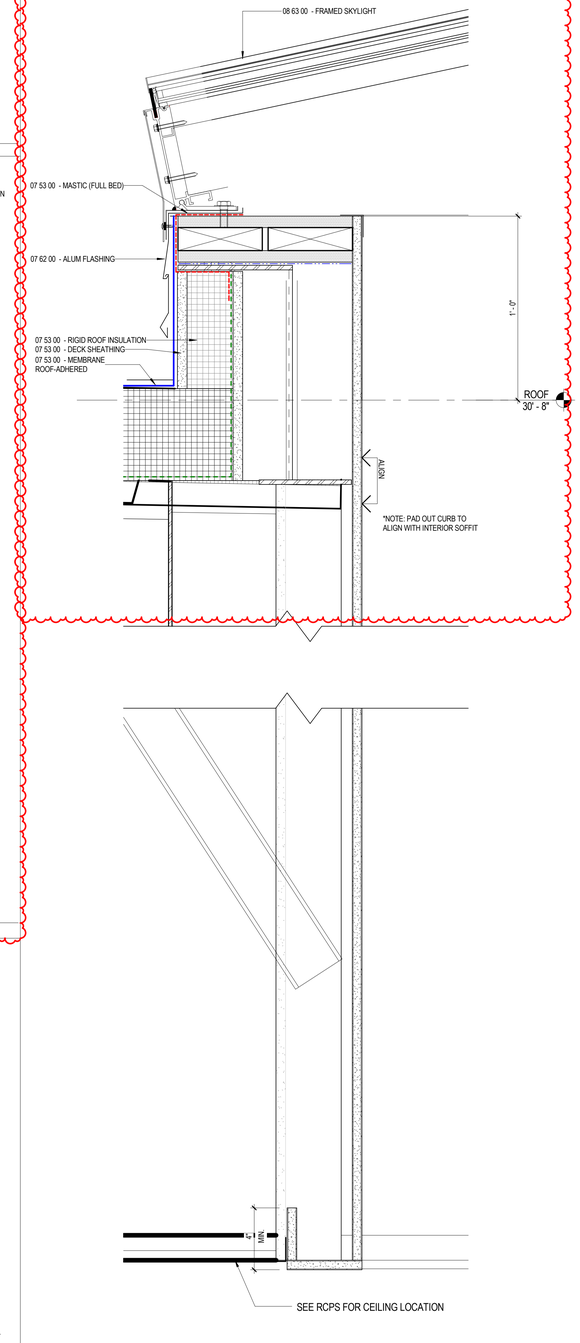
C8 A3.51 BUILDING SECTION - STEM PATHWAY SKYLIGHT
1 1/2" = 1'-0"



H8 A3.51 TYP. TUBULAR SKYLIGHT SECTION
3" = 1'-0"



J8 A3.51 TYP. PYRAMID SKYLIGHT SECTION
1/2" = 1'-0"



J11 A3.51 TYP. PYRAMID SKYLIGHT SILL DETAIL
3" = 1'-0"

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SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	Addendum 6	03/24/16

CONTENT:
SKYLIGHT SECTIONS & DETAILS

DRAWN BY:	KRL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	As indicated

A3.51

Project Phase
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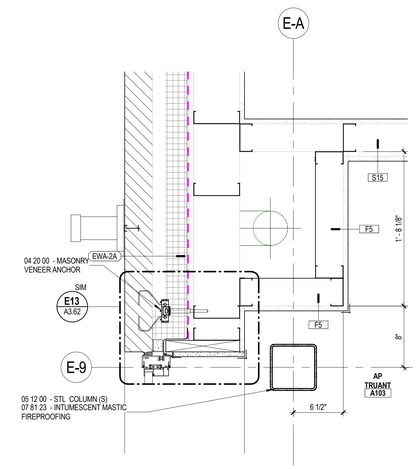
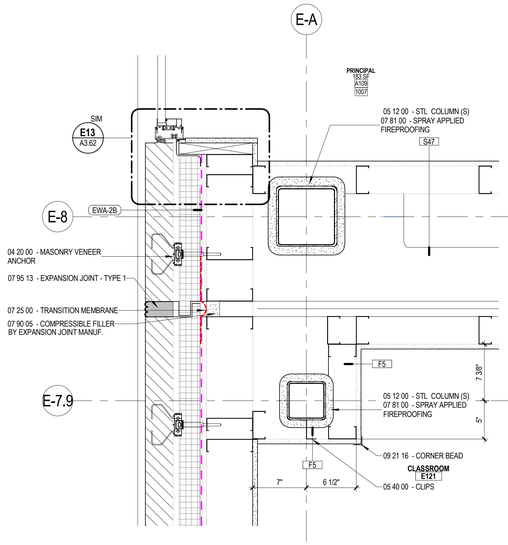


C1 A3.60 — EXTERIOR PLAN DETAIL - AREA A1- TRUANT A103
1 1/2" = 1'-0"



G1 A3.60 — EXTERIOR PLAN DETAIL- AREA A1 & E- EXPANSION JOINT
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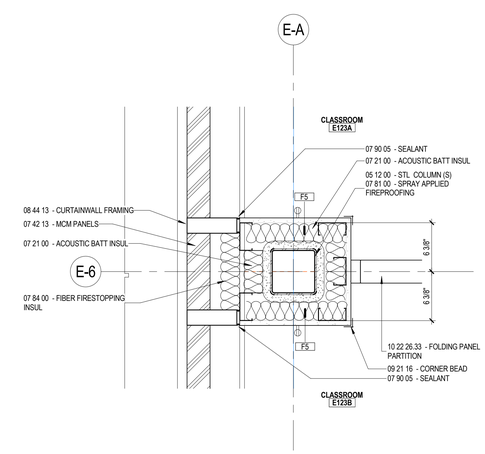
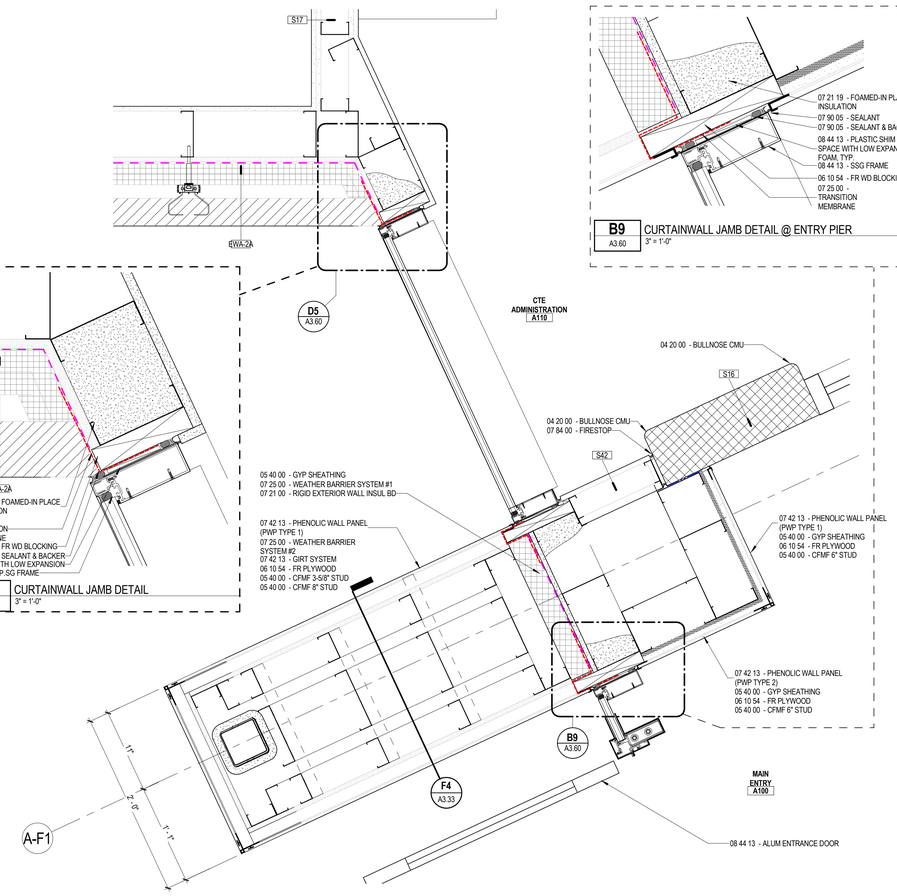
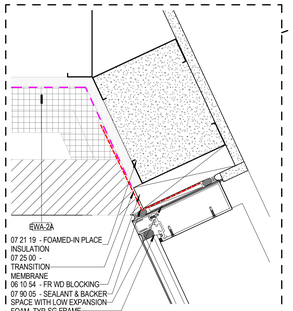


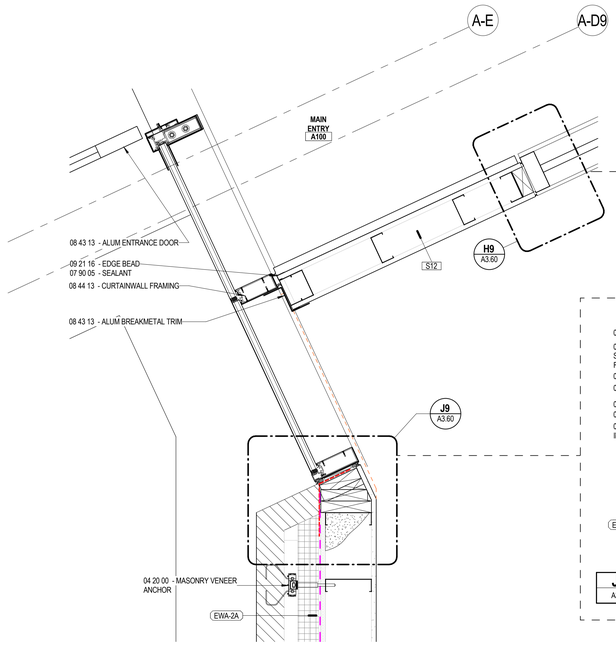
J1 A3.60 — EXTERIOR PLAN DETAIL- AREA E- CURTAIL WALL/ FOLDING PARTITION DETAIL
1 1/2" = 1'-0"

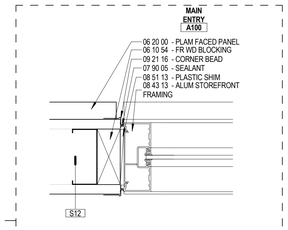




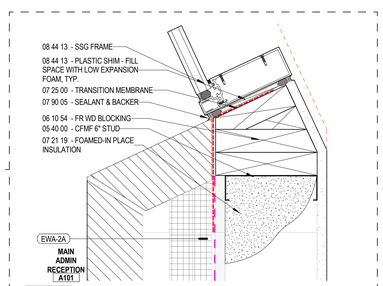
D5 A3.60 — CURTAINWALL JAMB DETAIL
3" = 1'-0"

B9 A3.60 — CURTAINWALL JAMB DETAIL @ ENTRY PIER
3" = 1'-0"

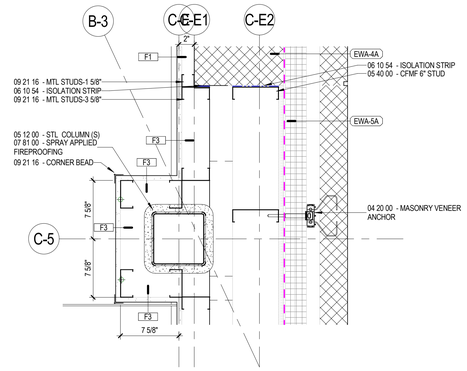




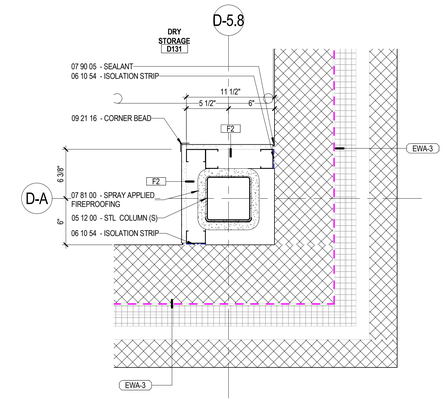
H9 A3.60 — RECEPTION WINDOW DETAIL
3" = 1'-0"



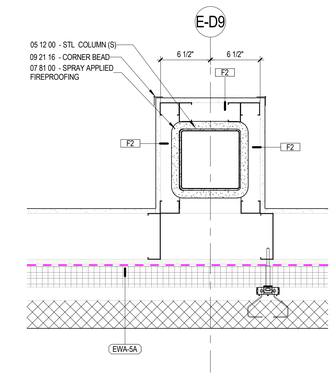
J9 A3.60 — CURTAINWALL JAMB DETAIL
3" = 1'-0"



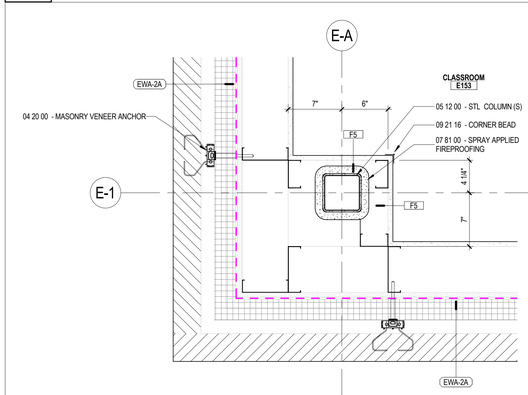
C11 A3.60 — CMU BLOCK BACKUP TO STUD BACK UP TRANSITION
1 1/2" = 1'-0"



E11 A3.60 — TYPICAL CORNER COLUMN SURROUND @ CMU BLOCK BACKUP
1 1/2" = 1'-0"



H11 A3.60 — TYPICAL COLUMN SURROUND @ METAL STUD BACKUP
1 1/2" = 1'-0"



J11 A3.60 — EXTERIOR PLAN DETAIL- AREA E - EXTERIOR CORNER
1 1/2" = 1'-0"

F5 A3.60 — EXTERIOR PLAN DETAIL- AREA A1- MAIN ENTRY NORTH
1 1/2" = 1'-0"

J5 A3.60 — EXTERIOR PLAN DETAIL- AREA A1- MAIN ENTRY SOUTH
1 1/2" = 1'-0"

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SANFORD, ME 04073

NO.	DESCRIPTION	DATE

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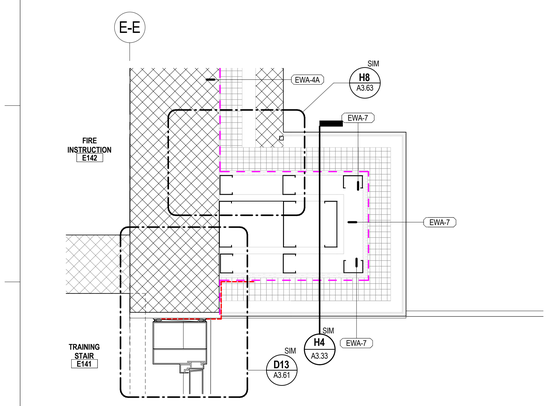
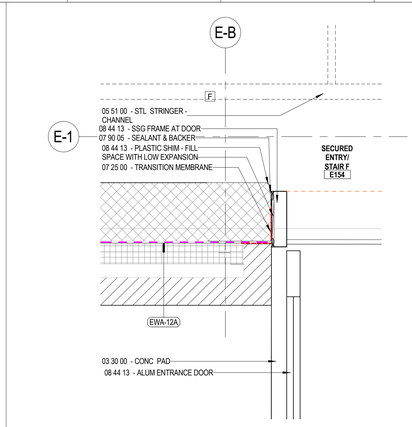
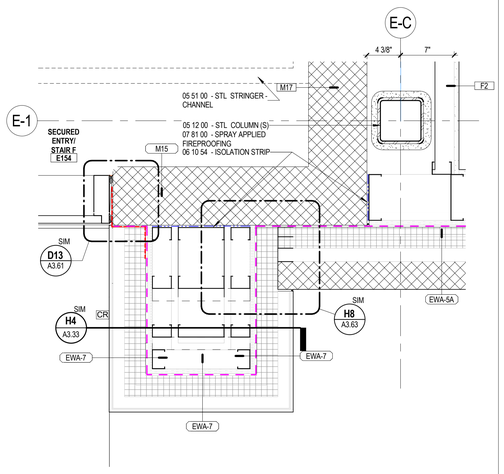


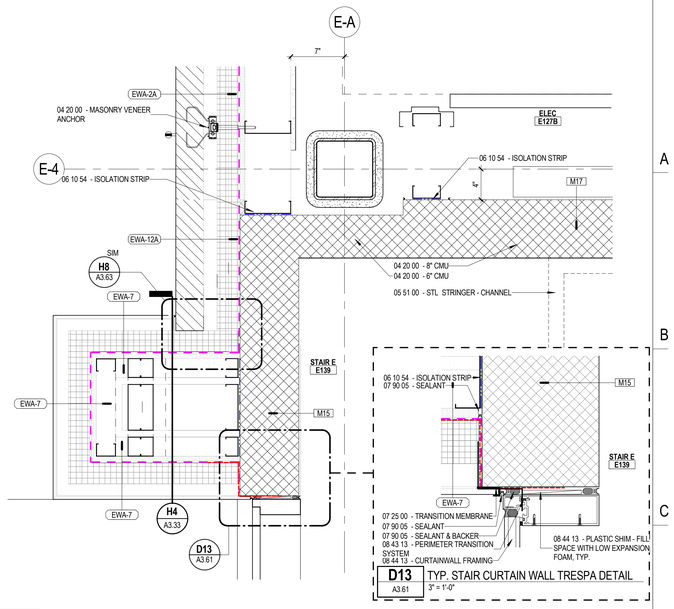
C1 A3.61 EXTERIOR PLAN DETAIL- AREA E - TRAINING STAIR E141
1 1/2" = 1'-0"



C4 A3.61 EXTERIOR PLAN DETAIL- AREA E- STAIR F
1 1/2" = 1'-0"

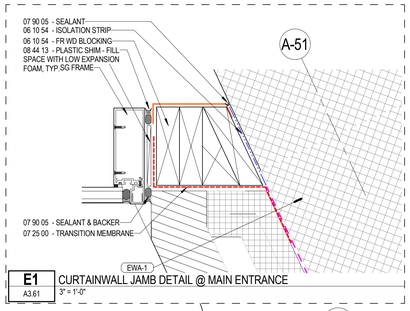


C7 A3.61 EXTERIOR PLAN DETAIL- AREA E- STAIR F
1 1/2" = 1'-0"

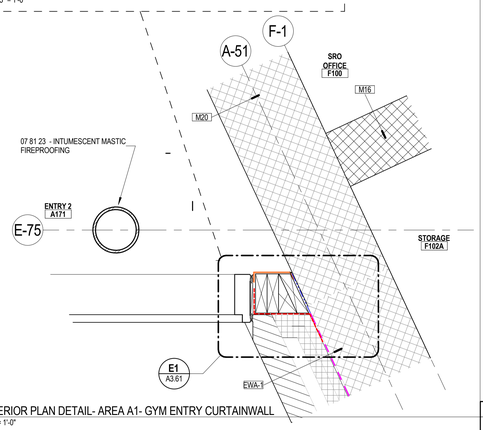


D13 A3.61 TYP. STAIR CURTAIN WALL TRESPA DETAIL
3" = 1'-0"

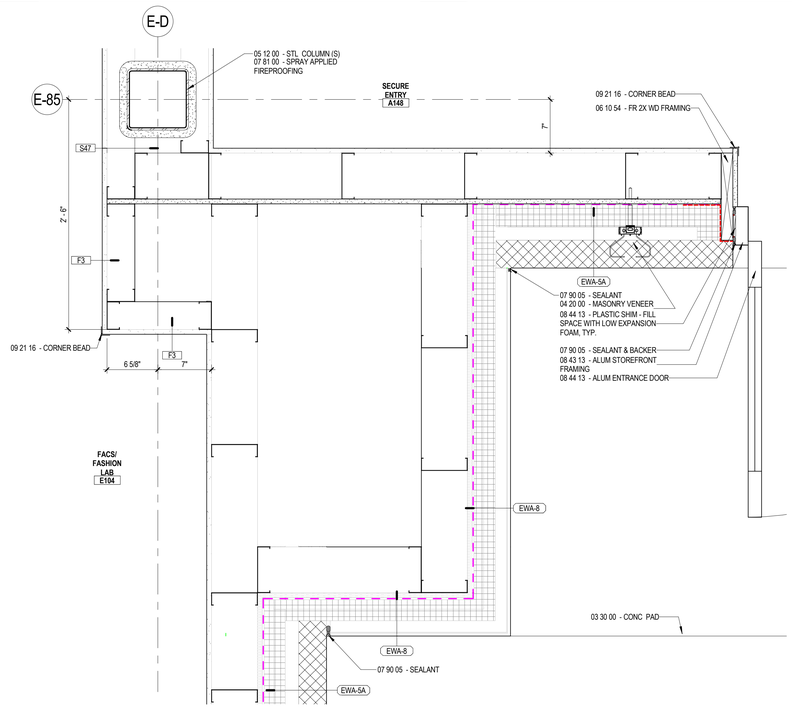
D10 A3.61 EXTERIOR PLAN DETAIL- AREA E- STAIR E LEVEL 1
1 1/2" = 1'-0"



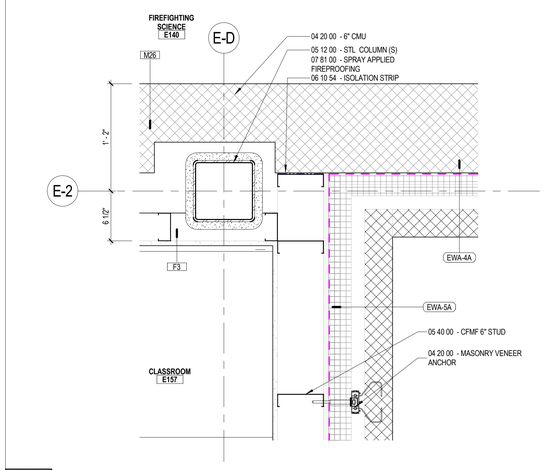
E1 A3.61 CURTAINWALL JAMB DETAIL @ MAIN ENTRANCE
3" = 1'-0"



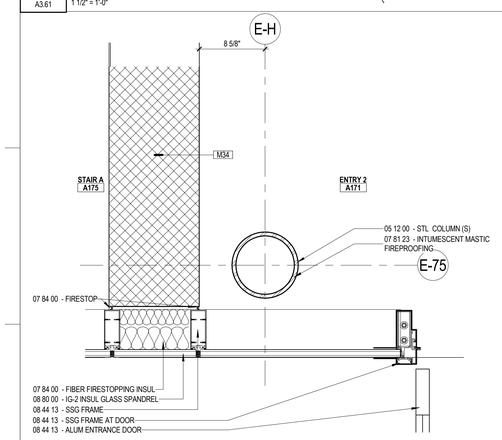
H1 A3.61 EXTERIOR PLAN DETAIL- AREA A1- GYM ENTRY CURTAINWALL
1 1/2" = 1'-0"



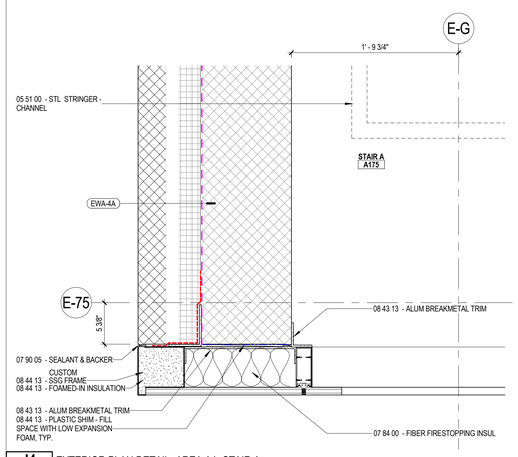
H4 A3.61 EXTERIOR PLAN DETAIL- AREA A1- EARLY CHILDHOOD ENTRY
1 1/2" = 1'-0"



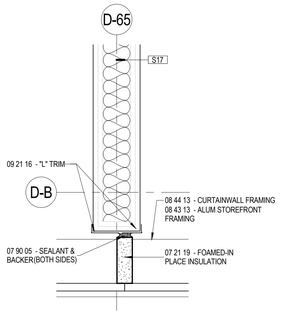
G10 A3.61 EXTERIOR PLAN DETAIL- AREA E- INSIDE CORNER DETAIL @ CLASSROOM E157
1 1/2" = 1'-0"



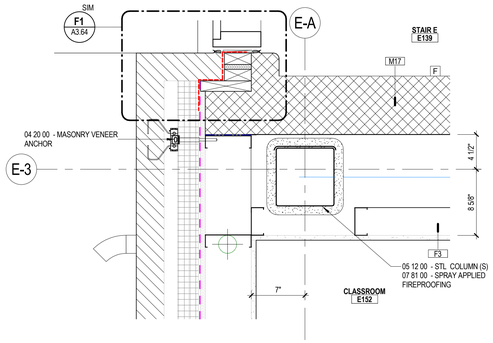
J1 A3.61 EXTERIOR PLAN DETAIL- AREA A1- STAIR A & GYM ENTRY
1 1/2" = 1'-0"



J4 A3.61 EXTERIOR PLAN DETAIL- AREA A1- STAIR A
1 1/2" = 1'-0"



J8 A3.61 EXTERIOR PLAN DETAIL - AREA D - LEVEL 1 ROOM D117A and D117B
1 1/2" = 1'-0"



J10 A3.61 EXTERIOR PLAN DETAIL- AREA E- STAIR E LEVEL 1
1 1/2" = 1'-0"

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NO.	DESCRIPTION	DATE

CONTENT:
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PROJECT NO:	12-067-00
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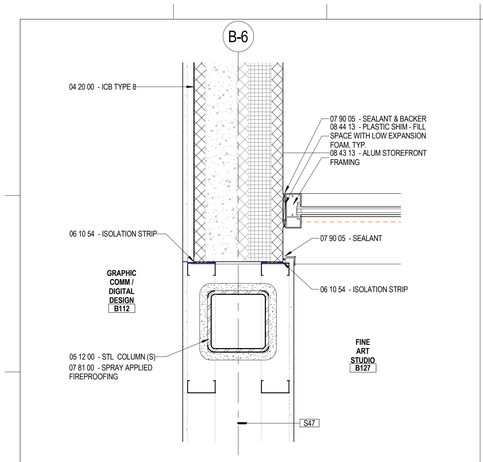
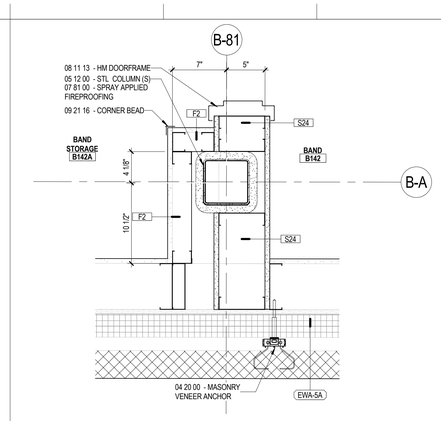
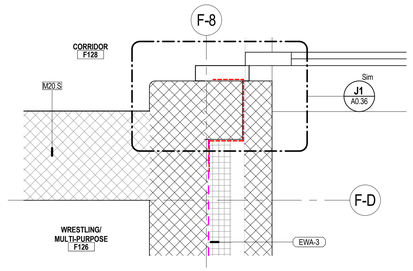


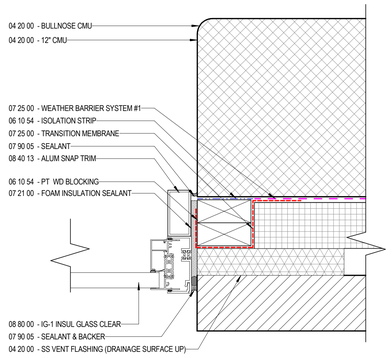
C1 A3.62 — EXTERIOR PLAN DETAIL- AREA B-FINE ART STUDIO B127
1 1/2" = 1'-0"



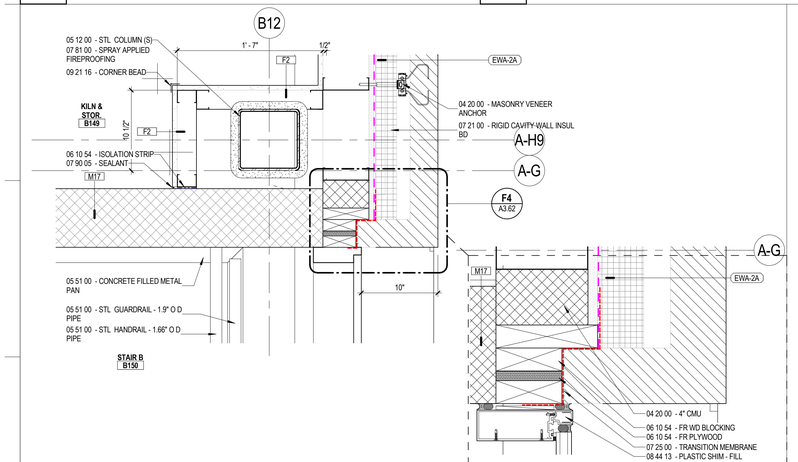
C4 A3.62 — EXTERIOR PLAN DETAIL- AREA B - COLUMN SURROUND
1 1/2" = 1'-0"



C7 A3.62 — LEVEL 1 - AREA F2 - CORRIDOR F128 ENTRANCE
1 1/2" = 1'-0"

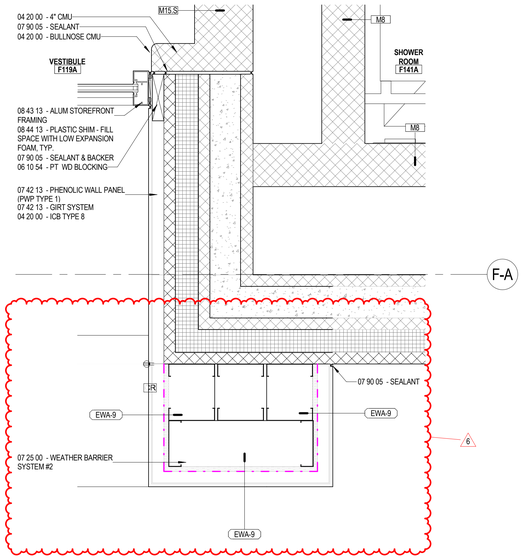


C10 A3.62 — WINDOW DETAIL FOR CMU BACKUP WALL @ JAMB
3" = 1'-0"

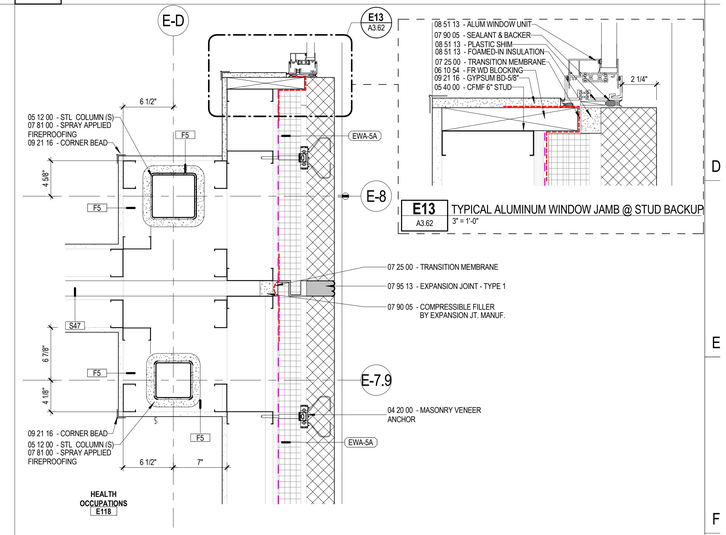


F4 A3.62 — TYP. CURTAIN WALL JAMB DETAIL AT MASONRY
3" = 1'-0"

G1 A3.62 — EXTERIOR PLAN DETAIL- AREA B- STAIR B B150
1 1/2" = 1'-0"

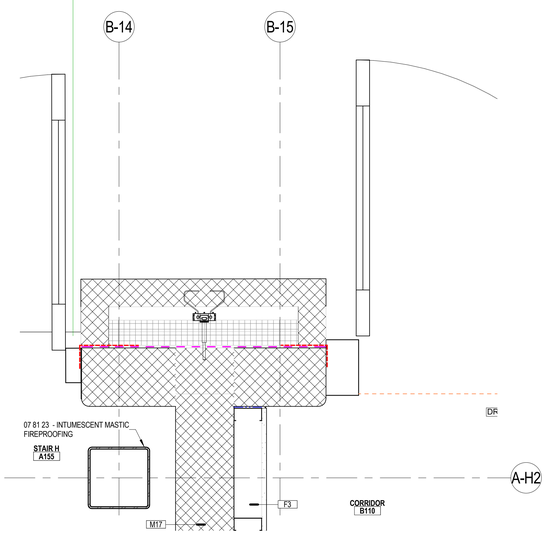


G6 A3.62 — LEVEL 1 -AREA F1 - VESTIBULE F119A PIER DETAIL
1 1/2" = 1'-0"

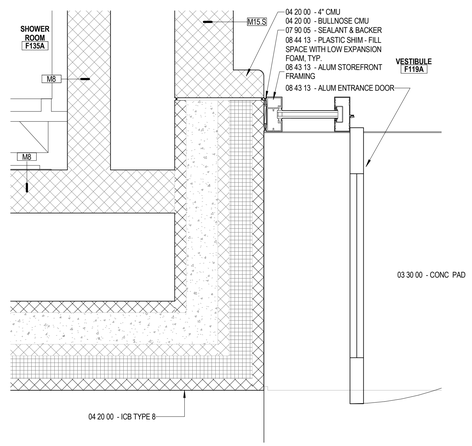


E13 A3.62 — TYPICAL ALUMINUM WINDOW JAMB @ STUD BACKUP
3" = 1'-0"

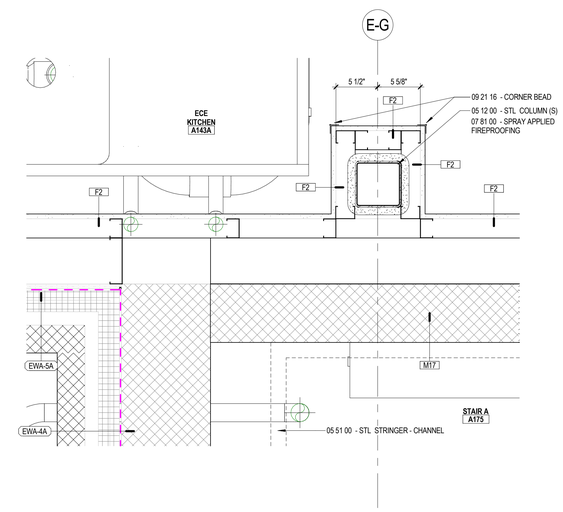
G10 A3.62 — EXTERIOR PLAN DETAIL- AREA E - HEALTH OCCUPATIONS E118
1 1/2" = 1'-0"



J1 A3.62 — EXTERIOR PLAN DETAIL- AREA A2- STAIR H
1 1/2" = 1'-0"



J6 A3.62 — EXTERIOR PLAN DETAIL- AREA F1-VESTIBULE F119A
1 1/2" = 1'-0"



J10 A3.62 — EXTERIOR PLAN DETAIL- AREA A1- STAIR A PLAN
1 1/2" = 1'-0"

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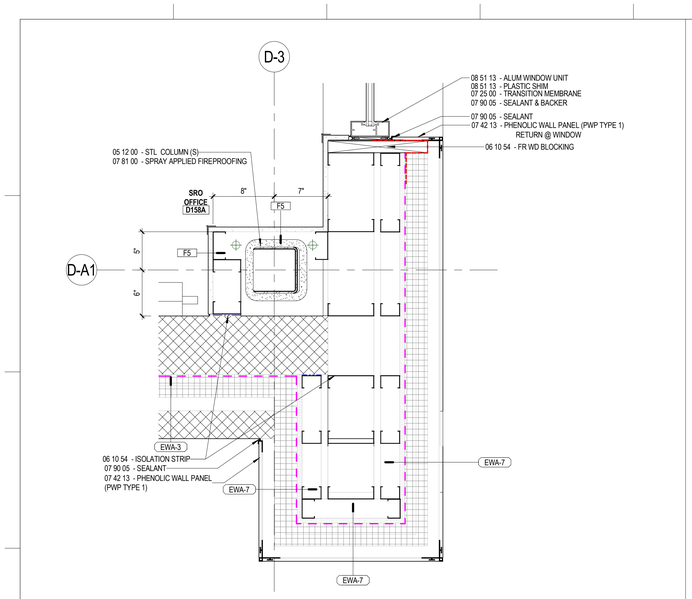
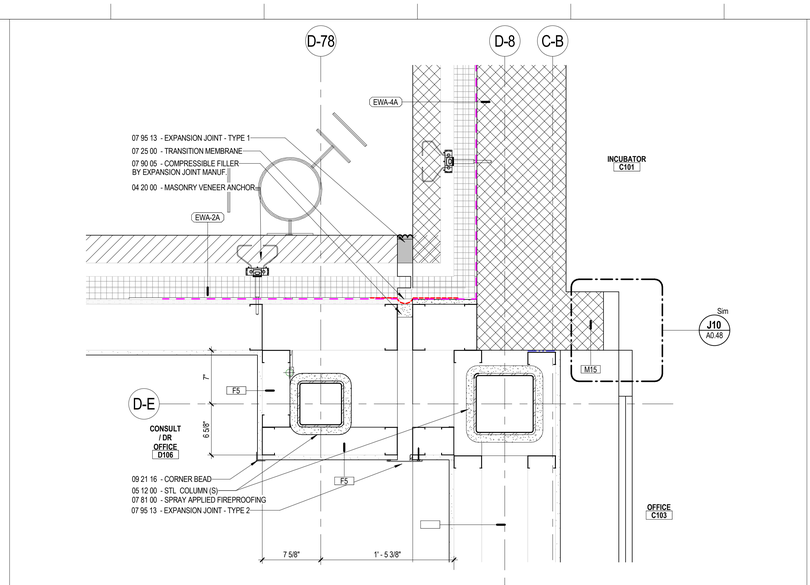
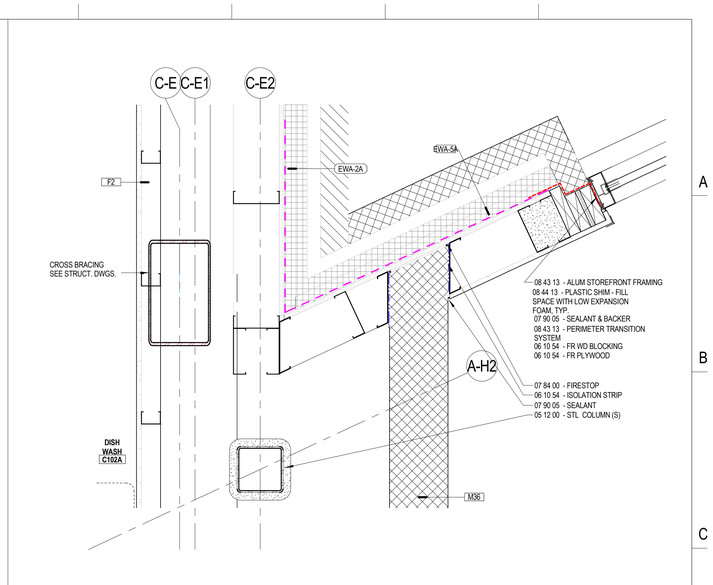


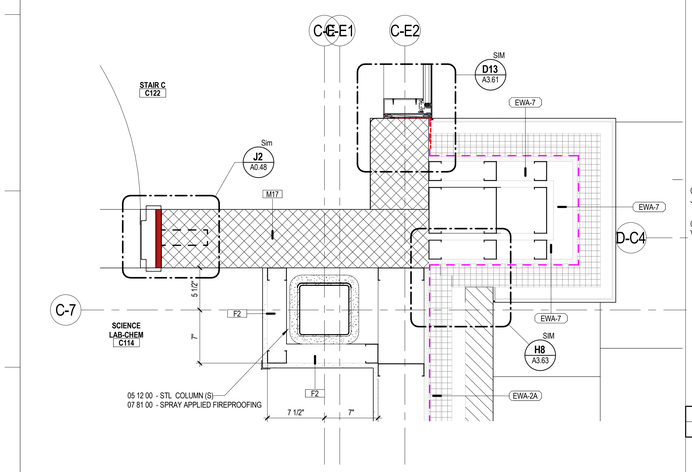
D1 A3.63 EXTERIOR PLAN DETAIL- AREA D-
1 1/2" = 1'-0"



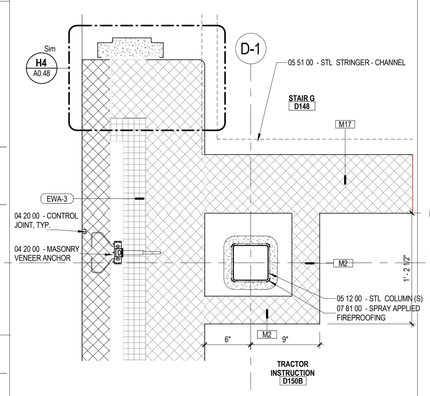
D5 A3.63 EXTERIOR PLAN DETAIL- AREA A2- EXPANSION JOINT @ INSIDE CORNER
1 1/2" = 1'-0"



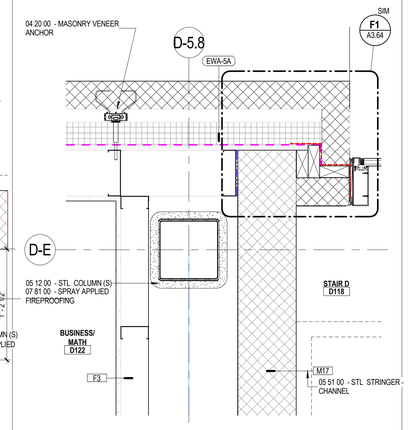
D10 A3.63 EXTERIOR PLAN DETAIL- AREA A2- DINING ENTRY CURTAINWALL
1 1/2" = 1'-0"



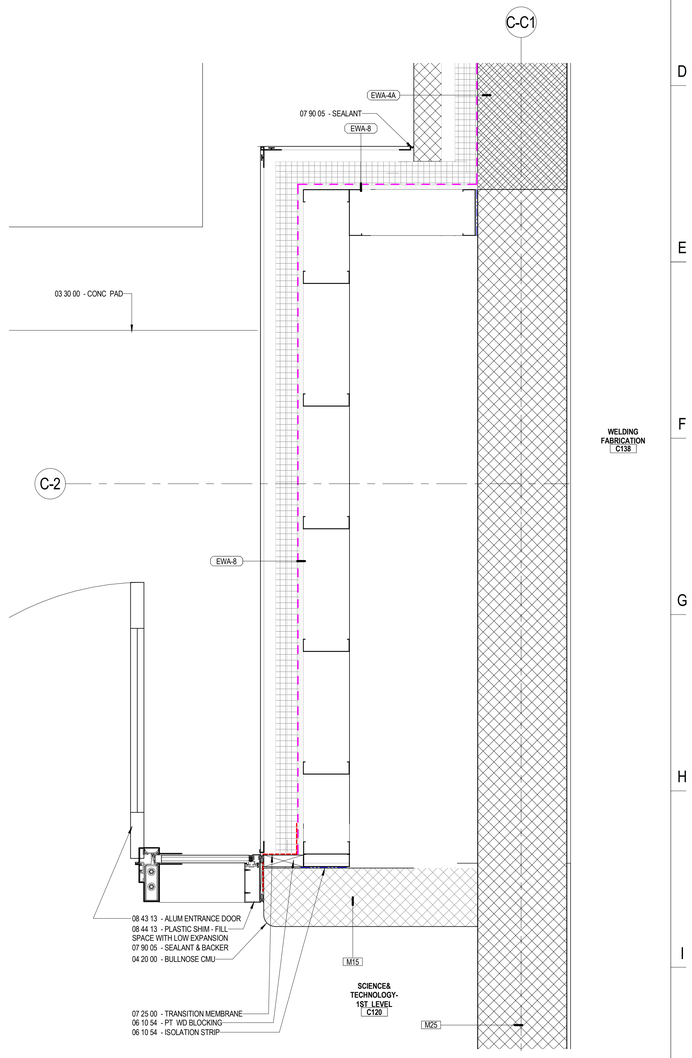
G1 A3.63 PLAN DETAIL @ STAIR C ENTRY
1 1/2" = 1'-0"



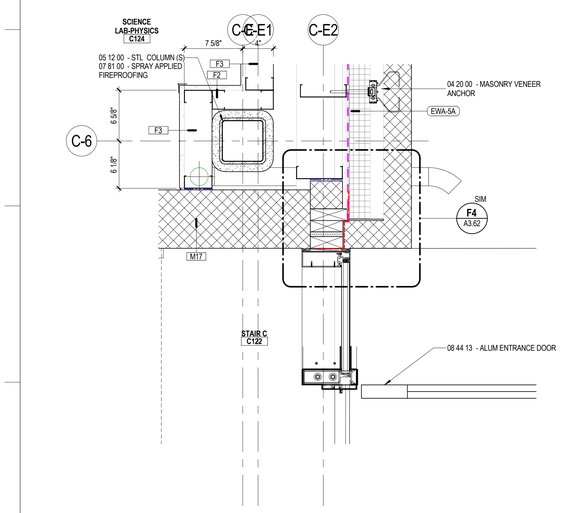
G5 A3.63 EXTERIOR PLAN DETAIL- AREA D- STAIR G
1 1/2" = 1'-0"



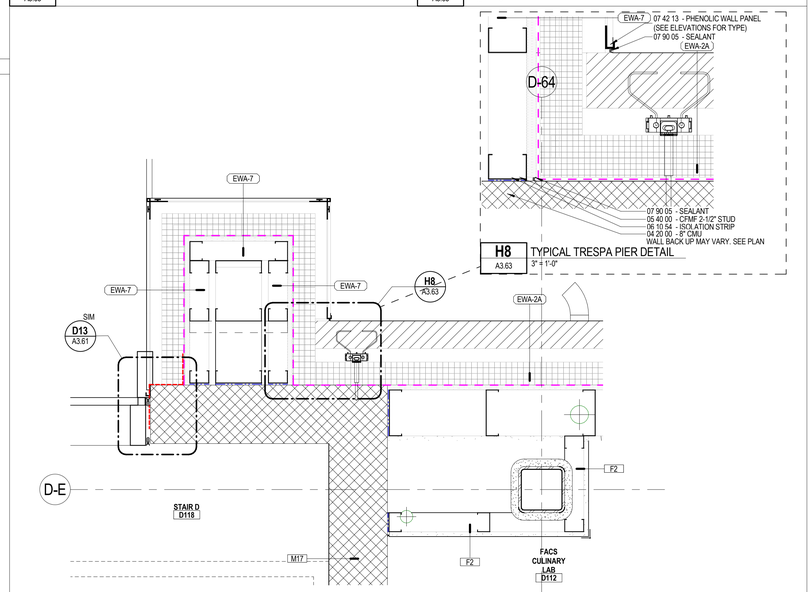
G8 A3.63 EXTERIOR PLAN DETAIL- AREA D- STAIR D
1 1/2" = 1'-0"



J10 A3.63 EXTERIOR PLAN DETAIL @ BUILDING C2 ENTRY
1 1/2" = 1'-0"



J1 A3.63 EXTERIOR PLAN DETAIL- AREA C1- STAIR C
1 1/2" = 1'-0"



J5 A3.63 EXTERIOR PLAN DETAIL- AREA D- STAIR D
1 1/2" = 1'-0"

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CONTENT:
EXTERIOR PLAN DETAILS

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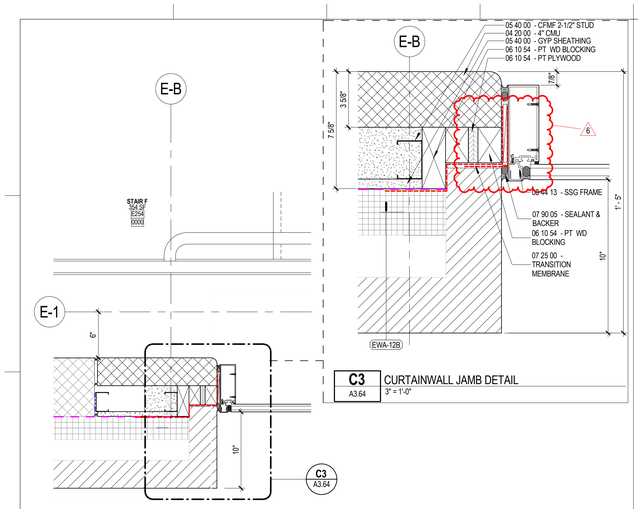
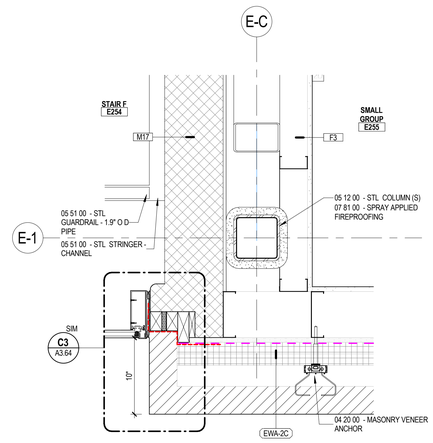
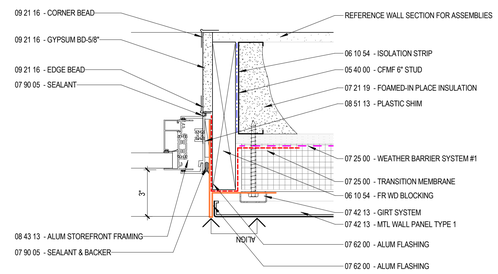


C3 A3.64 CURTAINWALL JAMB DETAIL
3" = 1'-0"

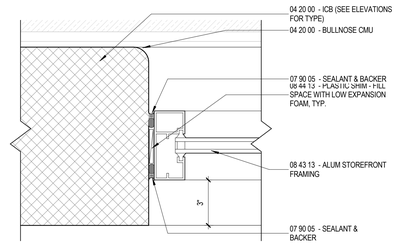


D1 A3.64 EXTERIOR PLAN DETAIL- AREA E- STAIR F LEVEL 2
1 1/2" = 1'-0"

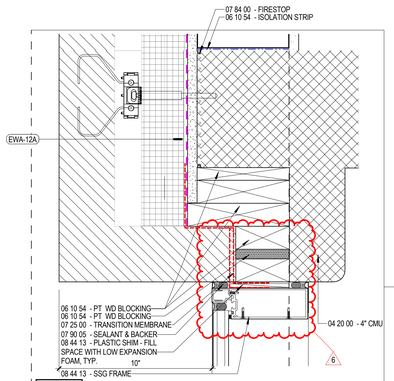
D5 A3.64 EXTERIOR PLAN DETAIL- AREA E- STAIR F LEVEL 2
1 1/2" = 1'-0"



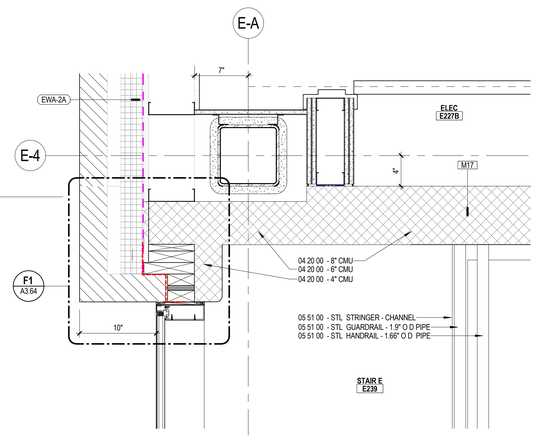
B8 A3.64 TYP. EXTERIOR PLAN DETAIL - GLAZING AT MTL PANEL AND STUD BACKUP
3" = 1'-0"



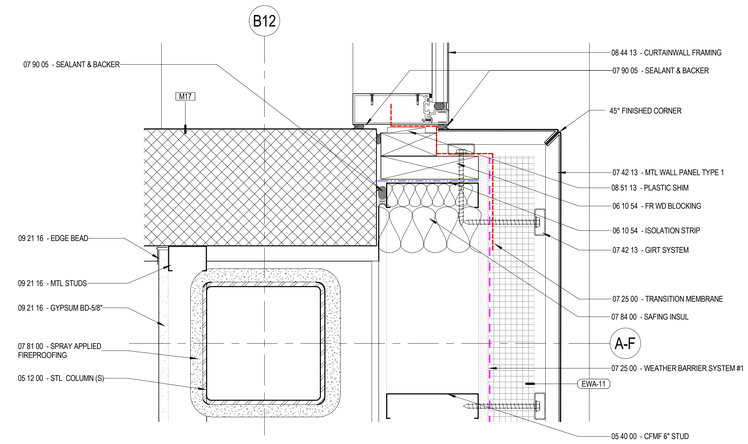
B12 A3.64 TYPICAL PLAN DETAIL - GLAZING AT INSULATED BLOCK WALL
3" = 1'-0"



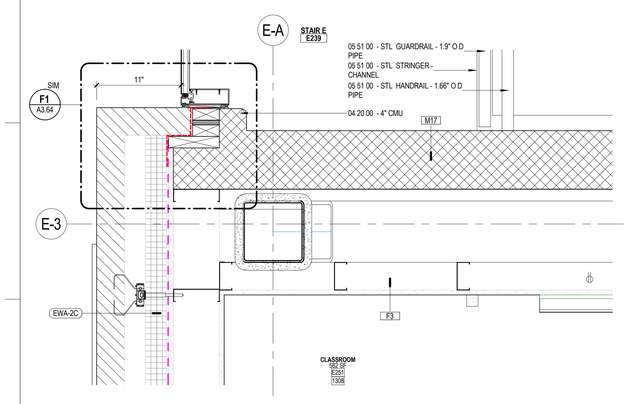
F1 A3.64 CURTAINWALL JAMB DETAIL
3" = 1'-0"



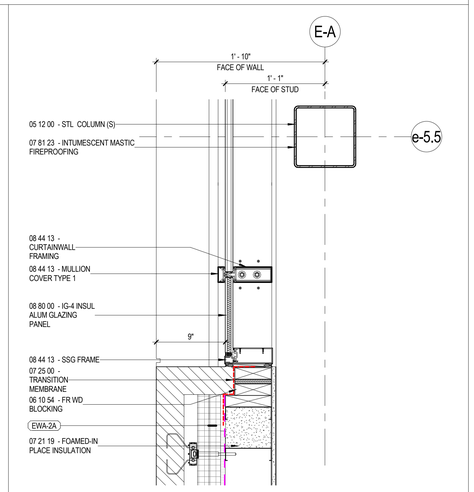
G1 A3.64 EXTERIOR PLAN DETAIL- AREA E- STAIR E LEVEL 2
1 1/2" = 1'-0"



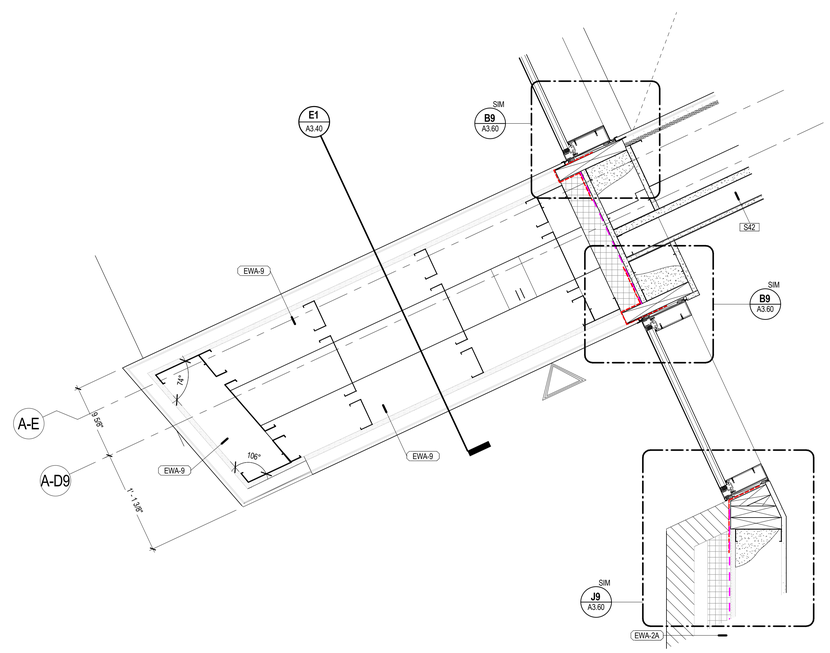
F8 A3.64 CURTAINWALL JAMB DETAIL AT MTL PANEL
3" = 1'-0"



J1 A3.64 EXTERIOR PLAN DETAIL- AREA E- STAIR E LEVEL 2
1 1/2" = 1'-0"



J5 A3.64 EXTERIOR PLAN DETAIL- CURTAIN WALL AT CLASSROOMS
1 1/2" = 1'-0"



J8 A3.64 EXTERIOR PLAN DETAIL- AREA A1- LEVEL 2 MAIN ENTRANCE
1 1/2" = 1'-0"

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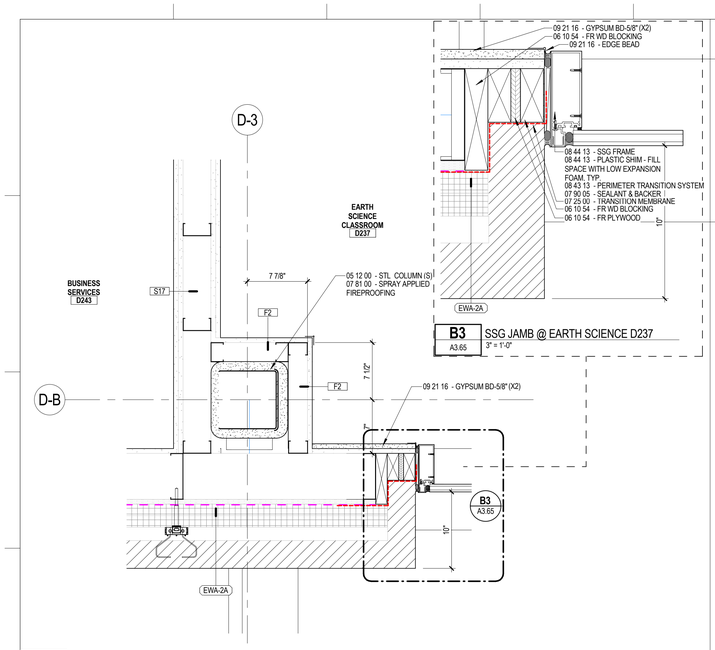
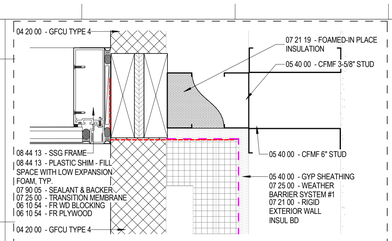
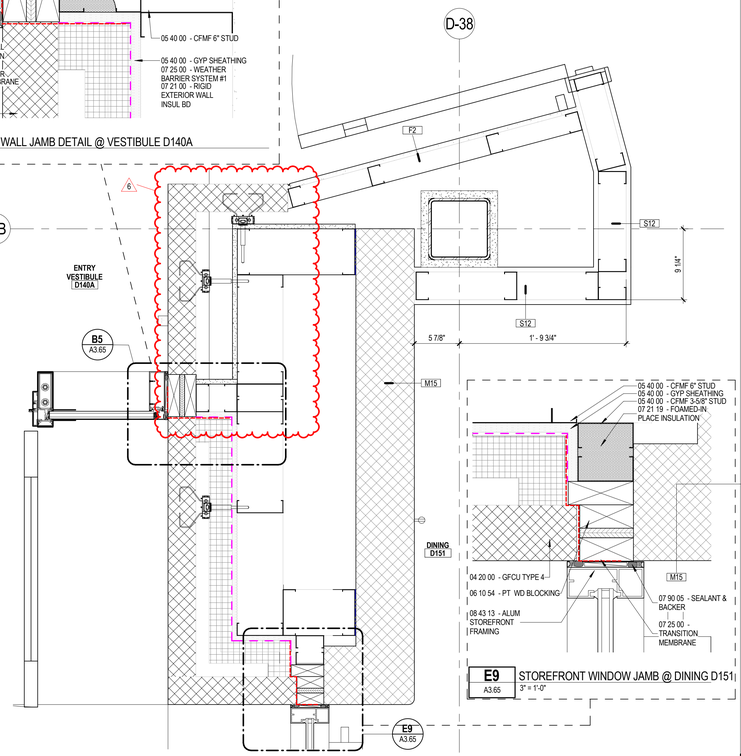


D1 A3.65 EXTERIOR PLAN DETAIL- AREA D- LEVEL 2
1 1/2" = 1'-0"

B3 A3.65 SSG JAMB @ EARTH SCIENCE D237
3" = 1'-0"

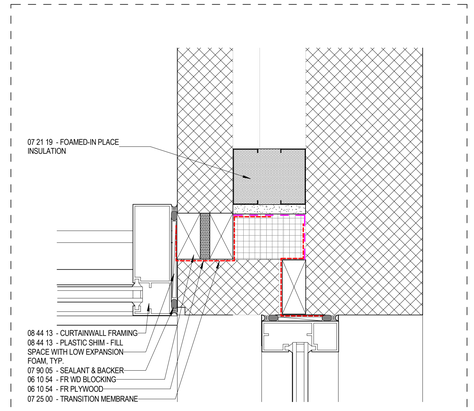


B5 A3.65 CURTAINWALL JAMB DETAIL @ VESTIBULE D140A
3" = 1'-0"

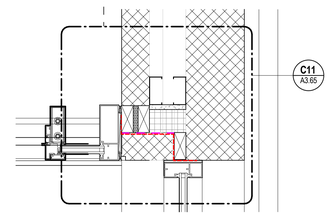


E5 A3.65 EXTERIOR PLAN DETAIL- AREA D- ENTRY VESTIBULE D140A
1 1/2" = 1'-0"

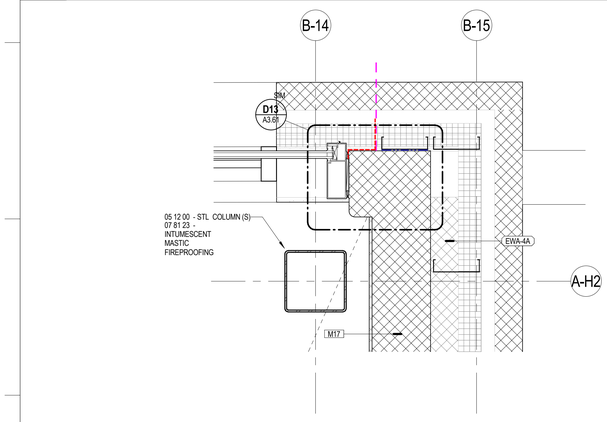
E9 A3.65 STOREFRONT WINDOW JAMB @ DINING D151
3" = 1'-0"



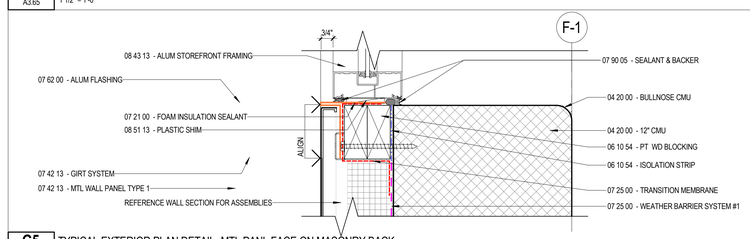
C11 A3.65 GREENHOUSE ENTRY/ WINDOW DETAIL
3" = 1'-0"



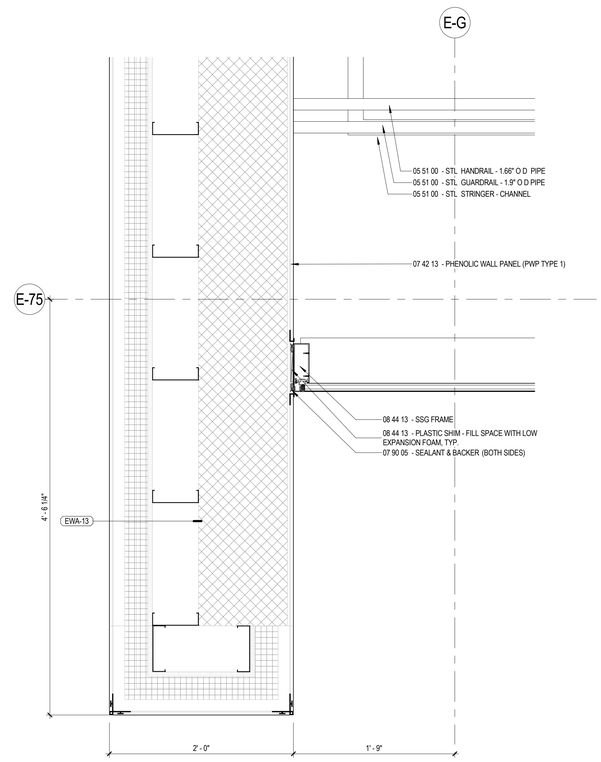
E11 A3.65 GREENHOUSE ENTRANCE PLAN DETAIL
1 1/2" = 1'-0"



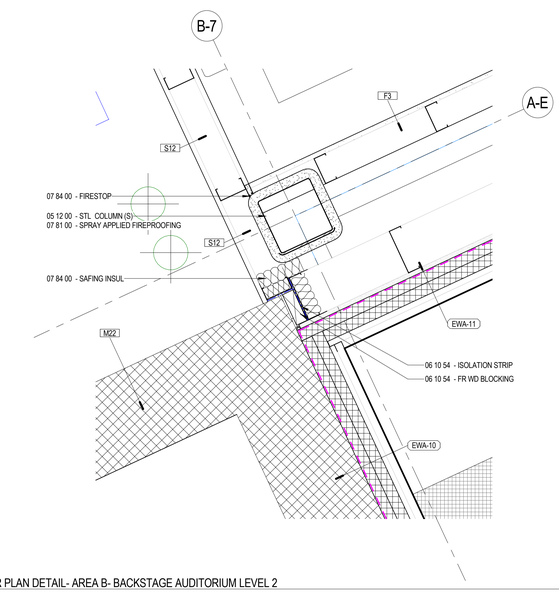
G1 A3.65 EXTERIOR PLAN DETAIL- AREA A2-STAIR H LEVEL 2
1 1/2" = 1'-0"



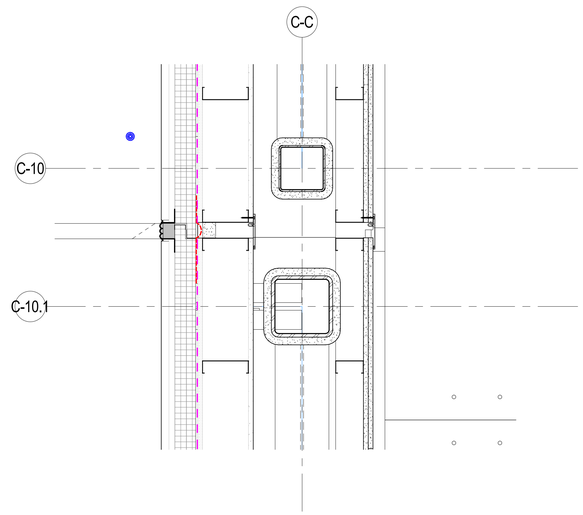
G5 A3.65 TYPICAL EXTERIOR PLAN DETAIL- MTL PANL FACE ON MASONRY BACK
3" = 1'-0"



J11 A3.65 LEVEL 2 - STAIR A PLAN - CURTAINWALL @ PIER PLAN DETAIL
1 1/2" = 1'-0"



J1 A3.65 EXTERIOR PLAN DETAIL- AREA B- BACKSTAGE AUDITORIUM LEVEL 2
1 1/2" = 1'-0"



J5 A3.65 LEVEL 2 - AREA A2 - UPPER METAL PANEL @ ROOF DETAIL
1 1/2" = 1'-0"

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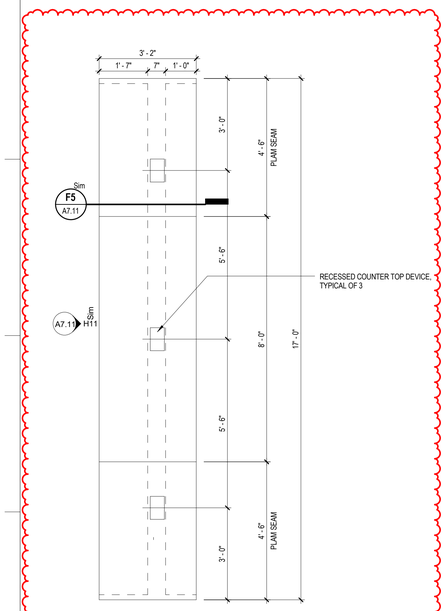
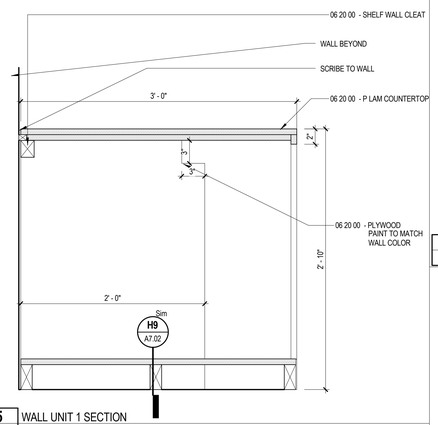
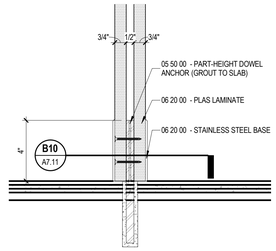


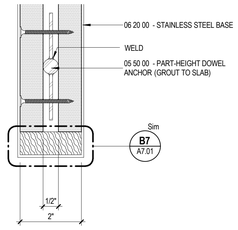
F1 A7.11 E WING: ISLAND PLAN
1/2" = 1'-0"



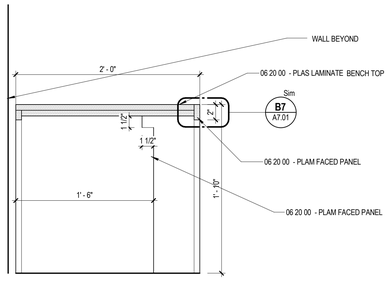
C5 A7.11 WALL UNIT 1 SECTION
1 1/2" = 1'-0"



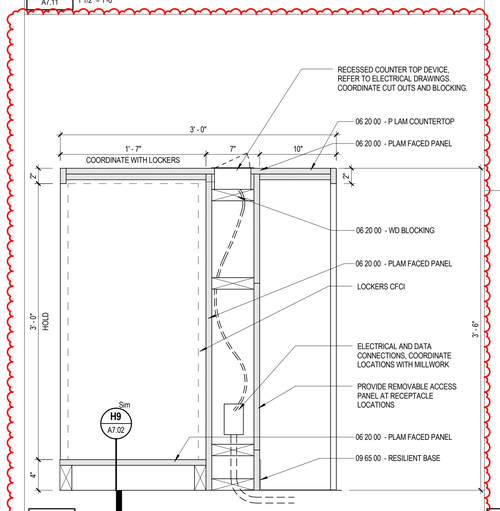
B8 A7.11 DOWEL TO SLAB DETAIL
3" = 1'-0"



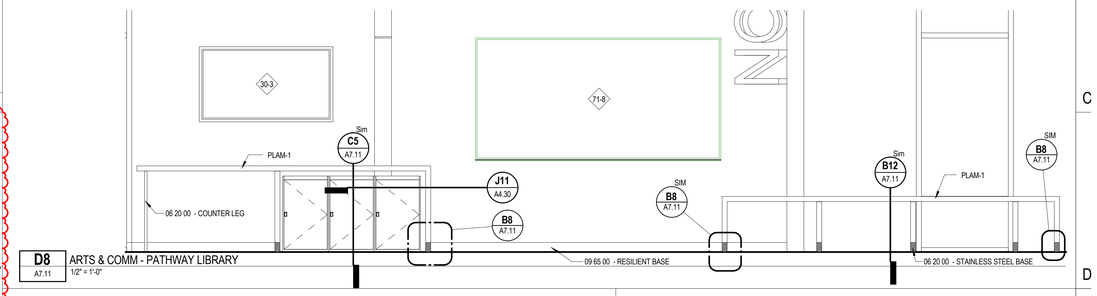
B10 A7.11 DOWEL TO SLAB SECTION
6" = 1'-0"



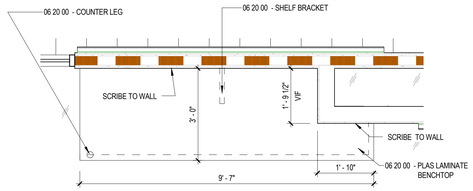
B12 A7.11 WALL UNIT 2 SECTION
1 1/2" = 1'-0"



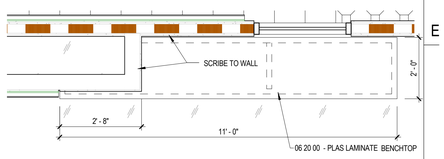
F5 A7.11 PATHWAY ISLAND SECTION
1 1/2" = 1'-0"



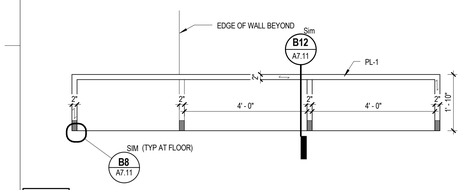
D8 A7.11 ARTS & COMM - PATHWAY LIBRARY
1/2" = 1'-0"



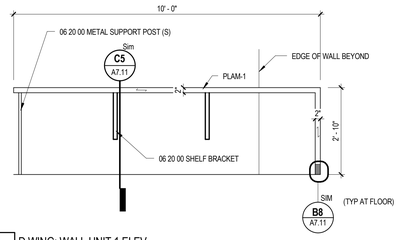
F8 A7.11 B WING: ART & COMMUNICATIONS PATHWAY COUNTER PLAN
1/2" = 1'-0"



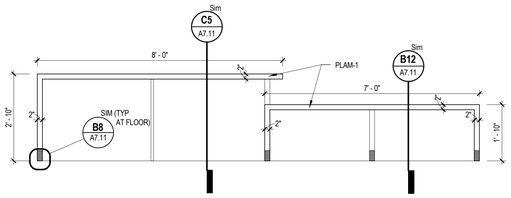
F12 A7.11 B WING: ART & COMMUNICATIONS PATHWAY BENCH PLAN
1/2" = 1'-0"



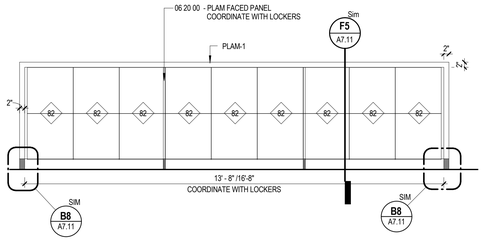
H1 A7.11 D WING: LIBRARY WALL UNIT 2
1/2" = 1'-0"



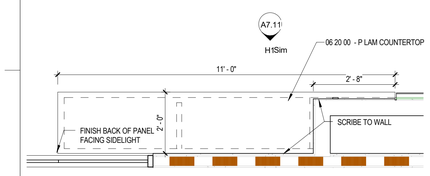
H4 A7.11 D WING: WALL UNIT 1 ELEV
1/2" = 1'-0"



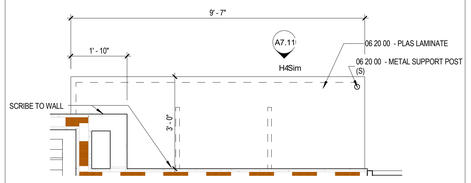
H7 A7.11 C WING: SCIENCE & TECHNOLOGY PATHWAY WALL UNIT ELEVATION
1/2" = 1'-0"



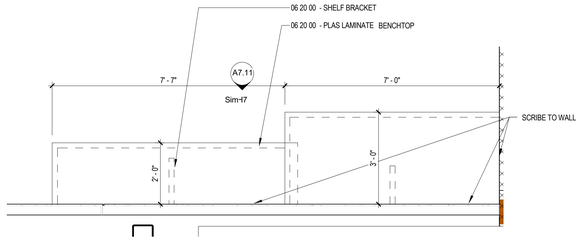
H11 A7.11 B & D WING: PATHWAY ISLAND ELEVATION
1/2" = 1'-0"



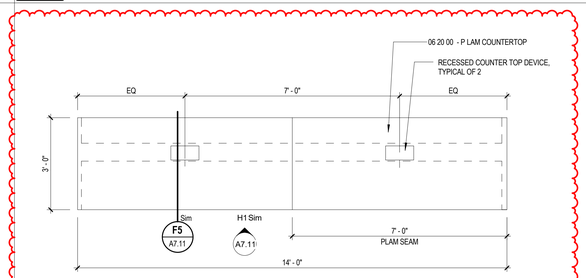
J1 A7.11 D WING: PATHWAY LIBRARY WALL UNIT 2 PLAN
1/2" = 1'-0"



J4 A7.11 D WING: PATHWAY LIBRARY WALL UNIT 1 PLAN
1/2" = 1'-0"



J7 A7.11 C WING: SCIENCE & TECHNOLOGY PATHWAY WALL UNIT PLAN
1/2" = 1'-0"



J11 A7.11 B & D WING: PATHWAY LIBRARY ISLAND PLAN
1/2" = 1'-0"

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CONTENT:
ENLARGED MILLWORK-PATHWAYS LIBRARIES

DRAWN BY:	SFW
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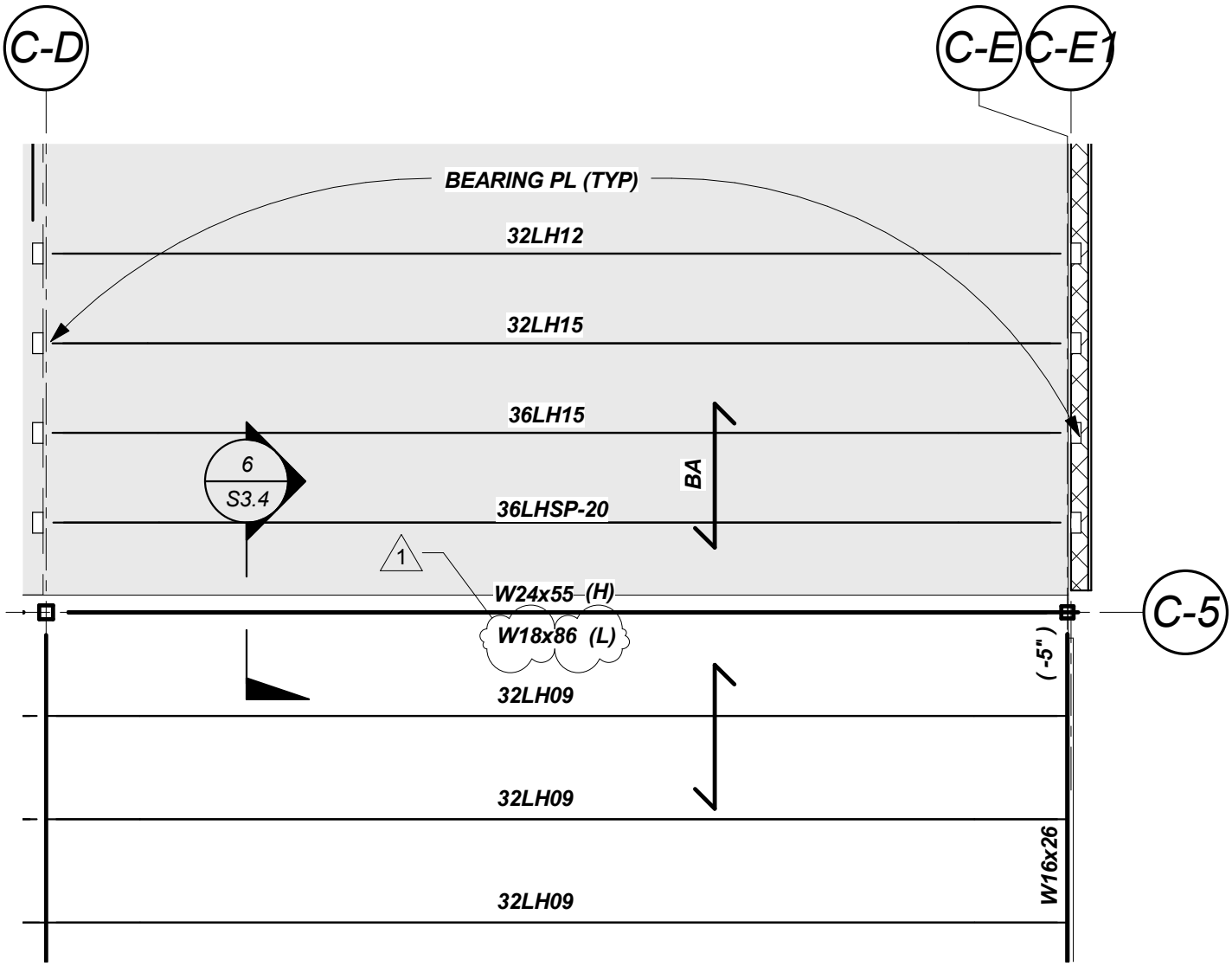

REF DWG S1.25

1 ADDENDUM 6 - 03/24/16

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STRUCTURAL ENGINEERS

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Designed	EAR
Drawn	WBH
Checked	EAR
Scale	NOTED
Date	03/24/16

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AND TECHNICAL CENTER
SANFORD, ME 04073

Becker Job Number
3261

SKS-01

LIGHTING LEGEND

Symbol	Description
A (N/L)	LIGHT FIXTURE,- RECESSED, WALL MOUNT, OR SURFACE MOUNT CONNECTED TO NORMAL POWER. "A" INDICATES FIXTURE TYPE, REFER TO LIGHTING FIXTURE SCHEDULE FOR ADDITIONAL INFORMATION
A (E)	(N/L) = NIGHT LIGHT (E) = FIXTURE CONNECTED TO EMERGENCY POWER (N/E) = FIXTURE CONNECTED TO NORMAL & EMEGENCY POWER
A	
A A A A	CEILING TRACK LIGHTS, "A" INDICATES FIXTURE TYPE, REFER TO LIGHTING FIXTURE SCHEDULE
	WALL MOUNTED EMERGENCY BATTERY FIXTURE
	WALL MOUNTED EMERGENCY BATTERY PACK
	REMOTE EMERGENCY FIXTURE HEAD(S)
	WALL MOUNTED EXIT LIGHT, FILLED AREA INDICATES FACE LOCATION. PROVIDE WITH ARROW DIRECTION INDICATING CHEVRONS AS SHOWN ON PLANS. REFER TO TYPICAL DEVICE LOCATIONS, UON
	CEILING MOUNTED EXIT LIGHT, FILLED AREA INDICATES FACE LOCATION. PROVIDE WITH ARROW DIRECTION INDICATING CHEVRONS AS SHOWN ON PLANS. REFER TO TYPICAL DEVICE LOCATIONS, UON
DT S	WALL OR CEILING MOUNTED, INFRARED/ULTRASONIC DUAL TECHNOLOGY OCCUPANCY SENSOR. SYSTEM CONNECTED UNLESS OTHERWISE NOTED. S = STAND-ALONE
IR S	WALL OR CEILING MOUNTED, INFRARED OCCUPANCY SENSOR. SYSTEM CONNECTED UNLESS OTHERWISE NOTED. S = STAND-ALONE
US S	WALL OR CEILING MOUNTED, ULTRASONIC OCCUPANCY SENSOR. SYSTEM CONNECTED UNLESS OTHERWISE NOTED. S = STAND-ALONE
DT S	CEILING MOUNTED, 360 °, INFRARED/ULTRASONIC DUAL TECHNOLOGY OCCUPANCY SENSOR. SYSTEM CONNECTED UNLESS OTHERWISE NOTED. S = STAND-ALONE
US S	CEILING MOUNTED, 360°, ULTRASONIC OCCUPANCY SENSOR. SYSTEM CONNECTED UNLESS OTHERWISE NOTED. S = STAND-ALONE
IR HB	CEILING MOUNTED, 360°, INFRARED OCCUPANCY SENSOR. SYSTEM CONNECTED UNLESS OTHERWISE NOTED. S = STAND-ALONE HB = HIGH BAY
B	REMOTE BALLAST OR DRIVER
E	EMERGENCY LIGHTING TRANSFER DEVICE WITH TEST SWITCH, UL924 LISTED
LCP	NORMAL LIGHTING CONTROL PANEL (REFER TO LIGHTING CONTROL WIRING DIAGRAMS & DETAILS)
C#	LIGHTING CONTROL STATION, # DENOTES STATION NUMBER
PCD	DAYLIGHTNG CONTROL PHOTOCELL SENSOR. MOUNT PER MANUFACTURERS SPECIFICATIONS (REFER TO LIGHTING CONTROL WIRING DIAGRAM) WEATHER PROOF
GLPAC-#	MULTI-CHANNEL LIGHTING CONTROL UNIT, SYSTEM CONNECTED UNLESS OTHERWISE NOTED. # INDICATES QUANTITY OF RELAYS. SEE SPECIFICATIONS. LOCATE ABOVE LIGHTING CONTROL STATION IN AN ACCESSIBLE CEILING (TYPICAL). (REFER TO LIGHTING CONTROL WIRING DIAGRAMS & DETAILS)
GLPP-#	MULTI-CHANNEL LIGHTING CONTROL UNIT, SYSTEM CONNECTED UNLESS OTHERWISE NOTED. # INDICATES QUANTITY OF RELAYS. SEE SPECIFICATIONS. LOCATE ABOVE LIGHTING CONTROL STATION IN AN ACCESSIBLE CEILING (TYPICAL). (REFER TO LIGHTING CONTROL WIRING DIAGRAMS & DETAILS)
EXP Z10	SINGLE CHANNEL LIGHTING CONTROL EXPANSION MODULE, SYSTEM CONNECTED UNLESS OTHERWISE NOTED. LOCATE ABOVE LIGHTING CONTROL STATION IN ACCESSIBLE CEILING (TYPICAL). (REFER TO LIGHTING CONTROL WIRING DIAGRAMS & DETAILS) Z10 = (0-10V) DIMMING MODULE ELV = ELECTRONIC LOW VOLTAGE DIMMING MODULE

SWITCHING & WIRING LEGEND

Symbol	Description
$	SINGLE POLE SWITCH, MH = 44"AFF, UON 3 = THREE-WAY 4 = FOUR-WAY PL = PILOT LIGHT D = DIMMER VS = VARIABLE SPEED CONTROLLER K = KEY OPERATED O = OCCUPANCY SENSOR OD = DUAL RELAY OCCUPANCY SENSOR T = DIGITAL TIMER LV = LOW VOLTAGE 6 XP = EXPLOSION PROOF
$$	DOUBLE SWITCHING, ONE SWITCH SHALL CONTROL INBOARD LAMP, OTHER SWITCH SHALL CONTROL OUTBOARD LAMP(S) OF CONTROLLED LIGHTING CIRCUIT
{ # }	LIGHTING CONTROL PANEL CIRCUIT NUMBER
{ E# }	EMERGENCY LIGHTING CONTROL PANEL CIRCUIT NUMBER
LP1(#)	HOMERUN TO DESIGNATED PANELBOARD, (#=QUANTITY OF HOMERUNS IF MULTIPLE) (2#12&1#12G-3/4"C., UON)
	ELECTRICAL WIRING CIRCUIT (IN WALLS AND CEILINGS)
	ELECTRICAL WIRING CIRCUIT (BELOW FLOOR OR SLAB)
	SWITCH OR CONTROL CIRCUIT
	EMERGENCY LIGHTING AC CIRCUIT
	DC CIRCUIT
	CONNECTION AT EQUIPMENT

DEMOLITION LEGEND

Symbol	Description
x	EXISTING EQUIPMENT OR DEVICE TO BE REMOVED
x	EXISTING EQUIPMENT OR DEVICE TO REMAIN XRL = EXISTING RELOCATED XRU = EXISTING BOX & CONDUIT REUSED XTR = EXISTING TO REMAIN XR = EXISTING TO BE REMOVED

CCTV LEGEND

Symbol	Description
CCTV	HEAD END EQUIPMENT LOCATION (RECORDER, MULTIPLEXER, MONITOR, ETC.)
X	RECESSED CEILING MOUNTED CAMERA AND ENCLOSURE X = CAMERA TYPE - REFER TO SPECIFICATIONS
X	WALL MOUNTED CAMERA AND ENCLOSURE X = CAMERA TYPE - REFER TO SPECIFICATIONS
	WALL MOUNTED INTERIOR CAMERA

POWER LEGEND

Symbol	Description
	NEW SURFACE MOUNTED PANELBOARD
	NEW RECESSED MOUNTED PANELBOARD
	EXISTING SURFACE MOUNTED PANELBOARD
	EXISTING RECESSED MOUNTED PANELBOARD
T	TRANSFORMER
	GROUNDED DUPLEX RECEPTACLE, MH=18"AFF, UON
	GROUNDED QUAD RECEPTACLE, MH=18"AFF, UON
	GFCI DUPLEX RECEPTACLE, MH=18"AFF, UON
	GFCI QUAD RECEPTACLE, MH=18"AFF, UON
	ISOLATED GROUND DUPLEX RECEPTACLE, MH=18"AFF, UON
	ISOLATED GROUND QUAD RECEPTACLE, MH=18"AFF, UON
	GROUNDED SINGLE RECEPTACLE, MH=18"AFF, UON
	TYPICAL RECEPTACLE SUBSCRIPTS E = EMERGENCY C = COUNTER HEIGHT F = SURFACE FLOOR MOUNTED (REFER TO DETAIL) CLG = CEILING MOUNTED T = TASKLIGHT CR = CORROSION RESISTANT WP = WEATHER PROOF TR = TAMPER RESISTANT IWB = INTERACTIVE WHITE BOARD A/V = AUDIO VISUAL 6 XP = EXPLOSION PROOF
A	SPECIAL PURPOSE RECEPTACLE, LETTER INDICATES TYPE, REFER TO SPECIAL PURPOSE RECEPTACLE SCHEDULE
A	RECESSED FLOOR BOX WITH FLUSH COVER PLATE, ROUTE CONDUITS IN FLOOR SLAB, SUBSCRIPT DENOTES FLOOR BOX TYPE, REFER TO FLOOR BOX SCHEDULE
B	POKE THRU FLOOR BOX WITH FLUSH COVER PLATE, ROUTE CONDUITS IN ACCESSIBLE CEILING BELOW, SUBSCRIPT DENOTES FLOOR BOX TYPE, REFER TO FLOOR BOX SCHEDULE
P	TWO SECTION POWER POLE
X	MOTOR LOCATION, X=HORSEPOWER *
	SINGLE PHASE MANUAL MOTOR STARTER W/HAND-AUTO SELECTOR SWITCH
	MAGNETIC STARTER (WITH HOA, UON)
	COMBINATION MAGNETIC STARTER, (WITH HOA, UON)
	DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH
J	JUNCTION BOX
JP	PULL BOX
	SINGLE SECTION, SURFACE PLUG MOLD. RECEPTACLES SPACED 18" APART, U.O.N.
	TWO SECTION, SURFACE RACEWAY. ■ INDICATES NORMAL DUPLEX RECEPTACLE LOCATION IN RACEWAY, UON IG = INDICATES ISOLATED GROUND RECEPTACLE LOCATION
	4" SQUARE RECESSED OUTLET BOX MOUNTED BEHIND SURFACE RACEWAY WITH CABLE AND CONDUIT FOR POWER, AS INDICATED ON DRAWINGS
D	RETRACTABLE EXTENSION CORD WITH RECEPTACLE
CP	CONTROL PANEL OR PACKAGE FURNISHED WITH EQUIPMENT
CS	CONTROL STATION FURNISHED WITH EQUIPMENT, WIRED BY ELECTRICAL CONTRACTOR. MH=48" UON. PROVIDE OUTLET BOX AS REQUIRED BY MANUFACTURER. PROVIDE MANUFACTURERS RECOMMENDED CABLE IN 1"C TO CONTROL PACKAGE
OAP	OIL SENSING ALARM RELAY PANEL (ELEVATOR SUMP) *
PLR	PUMP LOCKOUT RELAY (ELEVATOR SUMP) *

PS#	POWER SUPPLY, # INDICATES TYPE
	1 = CAMERA
	2 = DOOR STRIKE
	3 = DOOR RELEASE BAR **
	4 = DOOR EGRESS ALARM **

WC	ELECTRIC WATER COOLER - PROVIDE GFCI RECEPTACLE MOUNTED AT 24" AFF BEHIND WATER COOLER FOR POWER. *
HT	HEAT TRACE POWER DROP - PROVIDE CONNECTION AND TESTING OF HEAT TRACE CABLES (BY OTHERS) TO POWER SOURCE. COORDINATE REQUIREMENTS WITH PLUMBING CONTRACTOR
HD	ELECTRIC HAND OR HAIR DRYER, COORDINATE MH WITH ARCHITECT
T1	ELECTRONIC FLUSH-VALVE POWER SUPPLY FURNISHED BY PC, WIRED BY EC (COORDINATE NUMBER OF JUNCTION BOXES REQUIRED WITH PC)
MOD	120V MOTOR OPERATED DAMPER,
XX XX	MECHANICAL OR PLUMBING EQUIPMENT THAT REQUIRE POWER
ATS	AUTOMATIC TRANSFER SWITCH
SV	12x12x4 JUNCTION BOX
CSP	CEILING SERVICE PANEL
ETP	ELECTRONIC TRAP PRIMER
ELC	ELEVATOR CONTROLLER
INV	INVERTER
MTS	MANUAL TRANSFER SWITCH
BAS	BUILDING AUTOMATION SYSTEM
UM	UTILITY METER
CB	ENCLOSED CIRCUIT BREAKER
UPS	UNINTERRUPTIBLE POWER SUPPLY
XX LCD	LCD DISPLAY LOCATION - XX INDICATES HEIGHT AFF REFER TO WALL BOX SCHEDULE FOR MORE INFORMATION
PL	PILOT LIGHT
J BD	EQUIPMENT BUS DROP CONNECTION
FACP	SEMI-RECESSED FIRE ALARM CONTROL PANEL T=TRAINING DEVICE
FAS	SEMI-RECESSED FIRE ALARM SUBPANEL
SMCP	SMOKE CONTROL PANEL
AFD	ACCORDION FIRE DOOR
B X	BUS DROP CORD RECEPTACLE - X INDICATES TYPE - REFER TO SCHEDULE FOR MORE INFORMATION
CD	COUNTER-TOP DEVICE (POWER CORD PLUGS INTO RECEPTACLE IN DESK)

CONTROLS LEGEND

Symbol	Description
GS	GAS SHUTOFF *
SV	SOLENOID VALVE, PROVIDED BY MC - WIRED TO GAS SHUTOFF BY EC
VFD	VARIABLE FREQUENCY DRIVE (MOTOR STARTER) *
ATC	AUTOMATIC TEMPERATURE CONTROL PANEL *
KS	KEY OPERATED SWITCH
	REMOTE PUSH BUTTON
GAP	GENERATOR REMOTE ANNUNCIATOR PANEL
EPO	EMERGENCY POWER OFF PUSH BUTTON, MH=44"AFF, UON
BSS	BOILER SHUTDOWN SWITCH, REFER TO WIRING DIAGRAM
FTP	FUEL TANK MONITOR PANEL *
PB	MOTORIZED DOOR CONTROL PUSH BUTTON 44"AFF. PROVIDE 4" DOUBLE GANG OUTLET BOX W/ 3/4"C TO DOOR CONTROLLER, COORDINATE CABLING REQUIREMENTS WITH MANUFACTURER
R	RELAY WITH 277V OR 120V COIL AND CONTACTS RATED AS REQUIRED
C	MAGNETIC CONTACTOR WITH CONTACTS RATED AS REQUIRED
DB	DOOR BELL
BTC	BOILER THERMAL CUT-OUT *
T	LINE VOLTAGE THERMOSTAT *
A	AQUASTAT *
J1	JUNCTION BOX WITH BLANK COVER FOR TRANSFORMER
D	HEARING IMPAIRED DOOR BELL ANNUNCIATOR
R	REMOTE RELEASE
L	REMOTE LOCKDOWN

ONE LINE LEGEND

Symbol	Description
	NEW WIRE OR DEVICE
	EXISTING WIRE OR DEVICE TO REMAIN
	EXISTING WIRE OR DEVICE TO BE REMOVED
	CIRCUIT BREAKER
	SHUNT-TRIP CIRCUIT BREAKER
	DRAW-OUT CIRCUIT BREAKER
	FUSED DISCONNECT SWITCH XXXAF / XXXAT = SIZE
	TRANSFORMER
M	UTILITY METER
	AUTOMATIC TRANSFER SWITCH
	GROUND
	PANELBOARD (MAIN LUG)
	PANELBOARD (MAIN CIRCUIT BREAKER)
#	IDENTIFICATION FOR WIRE SIZE & QUANTITY (SEE CABLE SCHEDULE)
	LIGHTNING ARRESTOR
	FUSE
	SWITCH
	MOTOR
	COMBINATION MAGNETIC STARTER
	MAGNETIC STARTER
	WYE CONNECTION
	DELTA CONNECTION

AUDIO VISUAL LEGEND

Symbol	Description
AVR##	AUDIO VISUAL RACK *** ## = REFER TO HIGH OUTPUT DRAWINGS FOR MORE INFORMATION
DR1	LIGHTING DIMMER RACK ***
RP1	EMERGENCY RELAY PANEL ***
PP1	THEATER PANEL ***
PP2	THEATER PANEL ***
FB##	AUDIO VISUAL FLOOR BOX *** ## = REFER TO HIGH OUTPUT DRAWINGS FOR MORE INFORMATION
LVC1	SCREEN CONTROLLER ***

(*** = PROVIDED BY OTHERS, INSTALLED AND CONNECTED BY ELECTRICAL CONTRACTOR)

INTERCOM/MASTER CLOCK SYSTEM LEGEND

Symbol	Description
ICP	INTERCOM CONTROL PANEL
MCP	MASTER CLOCK CONTROL PANEL
LIN	LOCAL INTERCOM SYSTEM
INT	2-WAY W.P. EXTERIOR INTERCOM STATION MH = +60"AFF, UON M = MASTER STATION
PA	RECESSED CEILING MOUNTED PA SPEAKER
PA BB	SURFACE MOUNTED PA SPEAKER WITH BACK BOX
PA V	RECESSED PA SPEAKER WITH INTEGRAL VOLUME CONTROL
PA	RECESSED WALL MOUNTED PA SPEAKER T = TALK BACK SPEAKER WG = WIRE GUARD H = HORN TYPE SPEAKER
VC	VOLUME CONTROL KNOB, MH = 48" AFF, UON
LS	WALL MOUNTED LOUD SPEAKER
	WALL MOUNTED CLOCK WG = WIRE GUARD
PA H	WALL MOUNTED COMBINATION CLOCK/INTERCOM UNIT H = HORIZONTALLY MOUNTED V = VERTICALLY MOUNTED

MASS NOTIFICATION SYSTEM LEGEND

Symbol	Description
NAB	NOTIFICATION ALERT BEACON

ACCESS CONTROL SYSTEM LEGEND

Symbol	Description
ACP	MASTER ACCESS CONTROL PANEL
DAP	DOOR ACCESS SUB PANEL
MG	MAGNETIC MONITORING CONTACT
DRB	DOOR RELEASE BAR **
DE	DELAYED EGRESS CRASH BAR **
EPT	ELECTRIC POWER TRANSFER **
CR	CARD READER
DS	ELECTRIC DOOR STRIKE **
REX	REQUEST TO EXIT INFRARED SENSOR
EL	ELECTRIC LOCK
EH	ELECTRIC HINGE

SITE LEGEND

Symbol	Description
X	POLE MOUNTED FIXTURE, "X" INDICATES FIXTURE TYPE, (REFER TO LIGHTING FIXTURE SCHEDULE) PROVIDE HEADS AS REQUIRED
X	POST TOP FIXTURE, "X" INDICATES FIXTURE TYPE REFER TO LIGHTING FIXTURE SCHEDULE
X	BOLLARD LIGHT FIXTURE
	BOLLARD
	SPLICE CONNECTION, REFER TO WIRING DIAGRAM
B	BLUE LIGHT PHONE LOCATION
	UTILITY POLE

ELEVATOR LOBBY COMMUNICATIONS SYSTEM

Symbol	Description
ELM	ELEVATOR LOBBY COMMUNICATIONS SYSTEM - MASTER BOX
ELA	ELEVATOR LOBBY COMMUNICATIONS SYSTEM - CALL BOX

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT *
C	COUNTER HEIGHT
CLG	CEILING MOUNTED
CUH	CABINET UNIT HEATER *
DN	DOWN
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN *
EHH	ELECTRICAL HANDHOLE
EMH	ELECTRICAL MANHOLE
FB	FAN BOX *
FIBO	FURNISHED AND INSTALLED BY OWNER/OTHERS
HOA	HAND-OFF-AUTO SELECTOR SWITCH
HP	HORSEPOWER
LOR	LOCATED ON ROOF
MC	MECHANICAL CONTRACTOR
MCB	MAIN CIRCUIT BREAKER
MD	MOTORIZED DOOR **
MH	MOUNTING HEIGHT
NTS	NOT TO SCALE
OD	OVERHEAD DOOR **
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PC	PLUMBING CONTRACTOR
PUH	PROPELLER UNIT HEATER *
RF	RETURN FAN *
RTU	ROOF TOP UNIT *
SF	SUPPLY FAN *
SPCP	SEWAGE PUMP CONTROL PANEL
S/S	START/STOP PUSH BUTTONS
S. STL	STAINLESS STEEL
THH	TELECOMMUNICATIONS HANDHOLE
TMH	TELECOMMUNICATIONS MANHOLE
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
VP	VANDAL PROOF
WPCP	WELL PUMP CONTROL PANEL
WG	WIRE GUARD
WP	WEATHER PROOF
WUH	WALL MOUNTED UNIT HEATER *
*	EQUIPMENT PROVIDED BY MECHANICAL TRADE, WIRED BY ELECTRICAL TRADE
**	EQUIPMENT PROVIDED BY DOOR HARDWARE TRADE, WIRED BY ELECTRICAL TRADE

CIRCUIT BREAKER TYPES

AF	AFCI CIRCUIT BREAKER
G	GFCI CIRCUIT BREAKER
H	HACR CIRCUIT BREAKER
L	LOCKED-ON CIRCUIT BREAKER
S	SHUNT TRIP CIRCUIT BREAKER

ELECTRICAL TRADE NOTES

1. ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL, STATE AND LOCAL CODES AND THE CURRENT NATIONAL ELECTRICAL CODE (NEC) BY ELECTRICIANS LICENSED BY THE STATE IN WHICH THE WORK IS PERFORMED.
2. THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATION AND ELECTRICAL REQUIREMENTS OF ALL EQUIPMENT PRIOR TO INSTALLING ANY CONDUIT AND/OR CABLE. IF ELECTRICAL REQUIREMENTS DIFFER FROM THOSE INDICATED, OR IF ADDITIONAL EQUIPMENT IS REQUIRED BY CODE, INFORM THE ENGINEER.
3. WIRING FOR ALL SINGLE PHASE CIRCUITS, 20A OR SMALLER, SHALL BE A MINIMUM OF 2#12&1#12G-3/4"C., FOR CIRCUIT LENGTHS UNDER 100FT AND 2#10&1#10G-3/4"C., FOR CIRCUIT LENGTHS 100FT AND OVER , UNLESS OTHERWISE NOTED. CIRCUITS FOR ISOLATED GROUND RECEPTACLES SHALL INCLUDE ADDITIONAL ISOLATED GROUND CONDUCTOR. CIRCUITS FOR DOUBLE SWITCHED LIGHT FIXTURES SHALL INCLUDE ADDITIONAL SWITCHED CONDUCTOR(S) AS REQUIRED. THE SHARING OF NEUTRAL CONDUCTORS IS NOT ALLOWED.
4. MOUNTING HEIGHTS GIVEN FOR ALL WIRING DEVICES (WALL SWITCHES, RECEPTACLES, ETC.), FIRE ALARM DEVICES, TELEPHONE EQUIPMENT, SPEAKERS AND LIGHT FIXTURES ARE TO THE CENTERLINE OF THE JUNCTION BOX USED TO MOUNT THE DEVICE, UNLESS OTHERWISE NOTED.
5. REMOVE AND DISPOSE OF EXISTING ELECTRICAL EQUIPMENT AND ASSOCIATED BOXES, CONDUIT AND WIRE WHERE INDICATED OR WHERE LOCATED ON OR WITHIN WALLS AND CEILINGS BEING DEMOLISHED OR ALTERED AS A RESULT OF THIS CONTRACT, UNLESS OTHERWISE INDICATED. IT IS NOT THE INTENT OF THESE DRAWINGS TO INDICATE ALL ELECTRICAL ITEMS TO BE REMOVED.
6. CIRCUIT WIRING INDICATED ON DRAWINGS IS SCHEMATIC IN NATURE AND SHALL NOT BE CONSIDERED TO BE POINT-TO-POINT, UNLESS OTHERWISE NOTED.
7. EXISTING ELECTRICALLY POWERED ITEMS THAT REMAIN SHALL BE RECIRCUITED, IF NECESSARY, TO ENSURE CONTINUED OPERATION.
8. COORDINATE FINAL LOCATIONS OF CEILING LIGHT FIXTURES AND OTHER EQUIPMENT WITH REFLECTED CEILING PLANS AND ALL OTHER TRADE DRAWINGS PRIOR TO INSTALLATION.
9. WHERE LONG CIRCUIT LENGTHS ARE REQUIRED, ENSURE LESS THAN 3% VOLTAGE DROP UNDER FULL LOAD. INCREASE WIRE SIZE ON CIRCUITS 100 FEET LONG AND ABOVE.
10. PROVIDE AND ENSURE FIREPROOFING OF ALL CONDUIT, CABLING AND ANY OTHER ELECTRICAL DEVICES THROUGH FIRE RATED ASSEMBLIES.
11. PROVIDE PULL STRINGS IN ALL CONDUIT SYSTEMS LEFT FOR USE BY OTHERS.
12. MOUNTING HEIGHT FOR ELECTRICAL DEVICES (RECEPTACLES, MULTICOMMUNICATIONS OUTLETS, ETC) LOCATED ON EXTERIOR WALLS ABOVE FINTUBE SHALL BE 4" FROM TOP OF FINTUBE ENCLOSURE TO CENTERLINE OF ELECTRICAL DEVICE.
13. PROVIDE EXPANSION FITTINGS IN CONDUIT RISERS FROM ALL EXTERIOR UNDERGROUND CONDUITS TO FIXED EQUIPMENT OR CONDUIT FITTINGS AND PROVIDE FLEXIBLE CONNECTIONS TO ANY EQUIPMENT SUBJECT TO SETTLEMENT OR FROST HEAVES.
14. WHERE DOUBLE SWITCHES ARE INDICATED, FIXTURES SHALL BE PROVIDED WITH MULTIPLE BALLASTS.
15. ALL BRANCH CIRCUIT HOMERUN WIRING (POWER AND LIGHTING) BACK TO PANELBOARDS (NOT IN THE SAME ROOM AS THE CIRCUIT) SHALL BE A MINIMUM OF #10 AWG CONDUCTOR.

GENERAL NOTES

THE FOLLOWING GENERAL NOTES APPLY TO ALL RIST-FROST-SHUMWAY ENGINEERING, P.C., DRAWINGS AND TRADES ASSOCIATED WITH THOSE DRAWINGS INVOLVED ON THIS PROJECT:

G-1 RIST-FROST-SHUMWAY ENGINEERING, P.C., WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND/OR THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE GUIDANCE OF RIST-FROST-SHUMWAY ENGINEERING, P.C., WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES, AMBIGUITIES OR CONFLICTS WHICH ARE DISCOVERED OR ALLEGED.

G-2 ALL WORK SHALL CONFORM TO ALL FEDERAL, STATE, AND LOCAL CODES AND STANDARDS INCLUDING, BUT NOT LIMITED TO: NFPA, IBC, UL, SMACNA, OSHA, AND NEC.

G-3 THE CONTRACTOR AND ALL SUBCONTRACTORS SHALL PROTECT THE WORK SITE, SURROUNDING AREAS AND OCCUPANTS FROM DAMAGE AND INJURY.

G-4 THE CONTRACTOR AND ALL SUBCONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH THE CONTRACT DOCUMENTS. ALL DRAWINGS OF ANY PARTICULAR TRADE SHALL BE USED IN CONJUNCTION WITH DRAWINGS OF ALL OTHER TRADES TO COORDINATE ALL CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH THE AFFECTED WORK. ANY PROPOSED CHANGES, VARIATIONS OR SUBSTITUTIONS MUST BE REVIEWED AND ACCEPTED BY THE ENGINEER PRIOR TO IMPLEMENTATION.

G-5 ALL DRAWINGS ARE INTENDED TO SHOW THE GENERAL ARRANGEMENT, DESIGN INTENT AND EXTENT OF THE WORK. THEY SHALL BE CONSIDERED PARTLY DIAGRAMMATIC. THEY ARE NOT INTENDED TO BE SCALED FOR ROUGHING-IN MEASUREMENTS OR TO SERVE AS SHOP DRAWINGS.

G-6 THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS (AS-BUILT OR OTHERWISE) BEFORE COMMENCING FABRICATION, AND/OR ORDERING MATERIALS.

G-7 DETAILS SHOWN ON ANY DRAWING ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITIONS, UNLESS OTHERWISE INDICATED.

G-8 INFORMATION ON THESE DRAWINGS PERTAINING TO AS-BUILT CONSTRUCTION AND OTHER EXISTING CONDITIONS HAVE BEEN OBTAINED FROM OTHER DOCUMENTATION OR BY FIELD INVESTIGATION. (SEE GENERAL AND SUPPLEMENTAL CONDITIONS FOR LISTING). THIS INFORMATION IS PROVIDED FOR THE CONTRACTOR'S BENEFIT IN PERFORMANCE OF THE WORK.

G-9 IN THE EVENT THE CONTRACTOR ENCOUNTERS MATERIAL REASONABLY BELIEVED TO BE HAZARDOUS WHICH HAS NOT BEEN RENDERED HARMLESS, THE CONTRACTOR SHALL IMMEDIATELY STOP WORK IN THE AREA AFFECTED AND REPORT THE CONDITION TO THE OWNER AND ARCHITECT/ENGINEER IN WRITING. THE WORK IN THE AFFECTED AREA SHALL NOT BE RESUMED UNTIL WRITTEN VERIFICATION BY THE OWNER THAT THE MATERIAL HAS BEEN REMOVED OR OTHERWISE BEEN RENDERED HARMLESS.

G-10 ALL BRANCH CIRCUIT HOMERUN WIRING (POWER AND LIGHTING) BACK TO PANELBOARDS (NOT IN THE SAME ROOM AS THE CIRCUIT) SHALL BE A MINIMUM OF #10 AWG CONDUCTOR.

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NO.	DESCRIPTION	DATE
5	ADDENDUM #5	2016-03-17
6	ADDENDUM #6	2016-03-23

FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

CONTENT:
ELECTRICAL SYMBOLS LEGEND AND TRADE NOTES

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	NO SCALE

E0.01

Project Phase
BID DOCUMENTS

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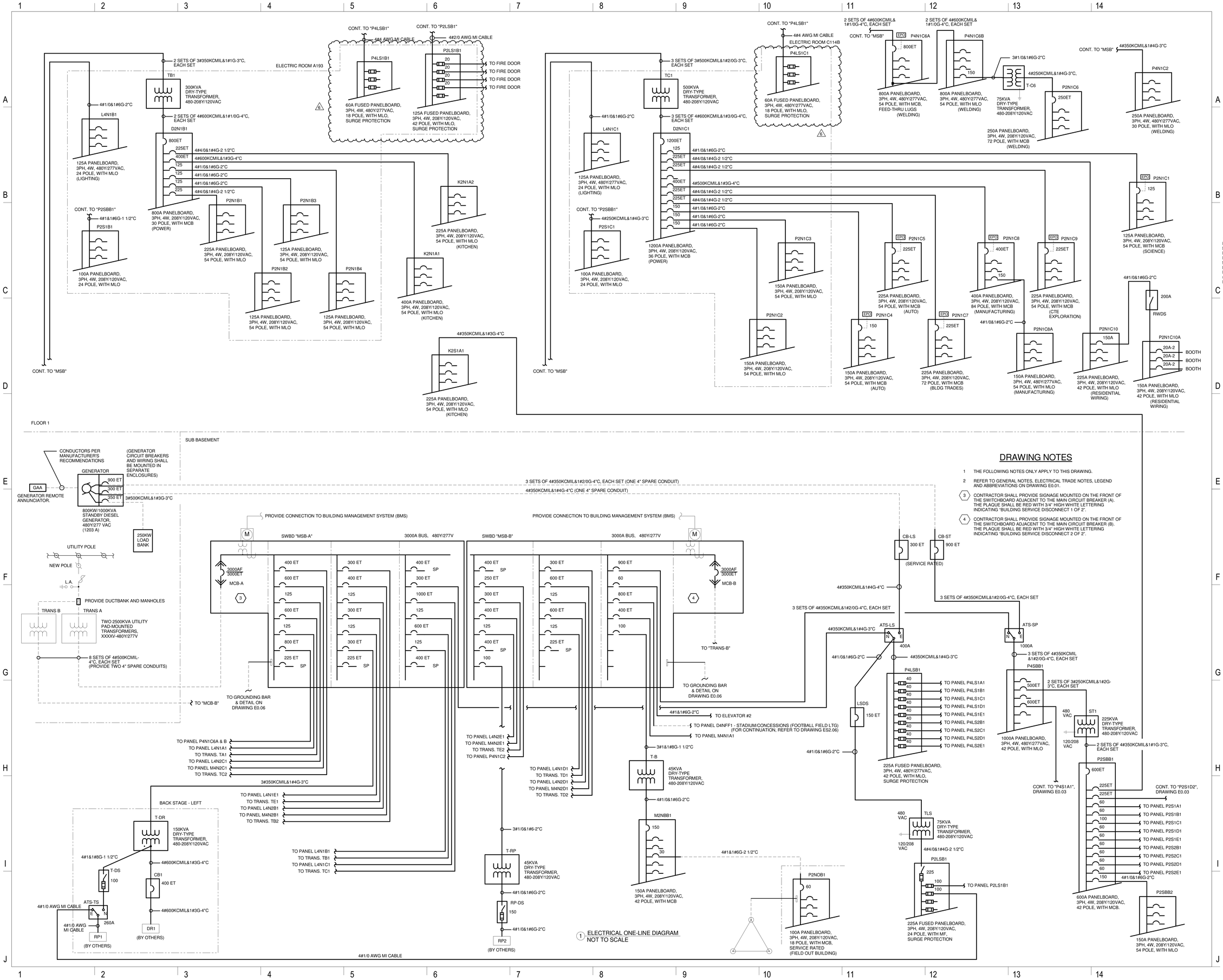

DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.
3. CONTRACTOR SHALL PROVIDE SIGNAGE MOUNTED ON THE FRONT OF THE SWITCHBOARD ADJACENT TO THE MAIN CIRCUIT BREAKER (A). THE PLAQUE SHALL BE RED WITH 3/4" HIGH WHITE LETTERING INDICATING "BUILDING SERVICE DISCONNECT 1 OF 2".
4. CONTRACTOR SHALL PROVIDE SIGNAGE MOUNTED ON THE FRONT OF THE SWITCHBOARD ADJACENT TO THE MAIN CIRCUIT BREAKER (B). THE PLAQUE SHALL BE RED WITH 3/4" HIGH WHITE LETTERING INDICATING "BUILDING SERVICE DISCONNECT 2 OF 2".

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Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
3	ADDENDUM #3	2016-03-04
4	ADDENDUM #4	2016-03-11
6	ADDENDUM #6	2016-03-23

CONTENT:
ELECTRICAL ONE-LINE DIAGRAM

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	AS NOTED

E0.02

Project Phase
BID DOCUMENTS

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FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

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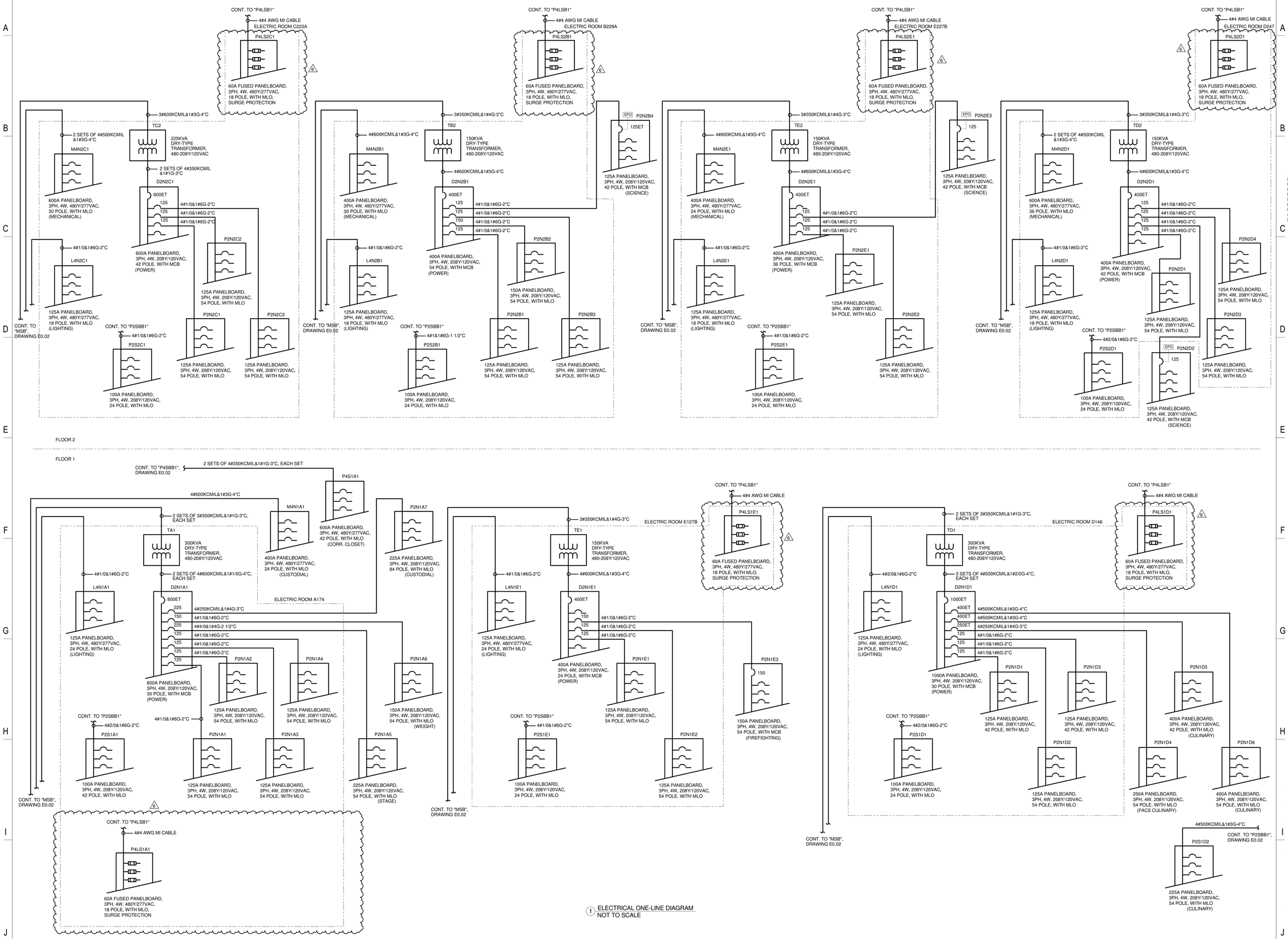
DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.



1 ELECTRICAL ONE-LINE DIAGRAM
NOT TO SCALE

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SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
5	ADDENDUM #5	2016-03-17
6	ADDENDUM #6	2016-03-23

FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

CONTENT: ELECTRICAL ONE-LINE DIAGRAM

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	AS NOTED

E0.03

Project Phase
BID DOCUMENTS

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ELECTRIC EQUIPMENT AND CONTROL SCHEDULE

EQUIPMENT ITEM NUM.	NAME	ROOM LOC.	AMPS	HP.	KW.	PHASE	SYSTEM VOLTS	SUPPLY PANEL OR CONTROL CENTER	CIRCUIT BREAKER	POWER WIRING FROM PANEL TO CONTROL UNIT AND FROM CONTROL UNIT TO EQUIPMENT: PHASE	GND	CONDUIT	REF. NOTES	ACCESSORIES FUSED DISCONNECT SWITCH	CONTROL DEVICES NOTES
DHU-1A	DEHUMID. UNIT #1A	ROOFTOP - B	97.2			3	480	M4N2B1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-1B	DEHUMID. UNIT #1B	ROOFTOP - B	97.2			3	480	M4N2B1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-2	DEHUMID. UNIT #2	ROOFTOP - C1	75.2			3	480	M4N2C1	90/3	4#2 AWG	1#8 AWG E.G.	1 1/2"C	A	PROVIDE WP	3
DHU-3	DEHUMID. UNIT #3	ROOFTOP - C1	142.2			3	480	M4N2C1	150/3	4#2/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-4	DEHUMID. UNIT #4	ROOFTOP - C2	111.2			3	480	M4N2C1	125/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-5	DEHUMID. UNIT #5	ROOFTOP - C2	111.2			3	480	M4N2C1	125/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-6A	DEHUMID. UNIT #6A	ROOFTOP - A2	82.2			3	480	M4N2D1	100/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-6B	DEHUMID. UNIT #6B	ROOFTOP - D	97.2			3	480	M4N2D1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-7	DEHUMID. UNIT #7	ROOFTOP - D	111.2			3	480	M4N2D1	125/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-8	DEHUMID. UNIT #8	ROOFTOP - E	142.2			3	480	M4N2E1	150/3	4#2/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-9	DEHUMID. UNIT #9	ROOFTOP - E	111.2			3	480	M4N2E1	125/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-10	DEHUMID. UNIT #10	ROOFTOP - F1	97.2			3	480	M4N1A1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-11	DEHUMID. UNIT #11	ROOFTOP - F2	77.5			3	480	M4N1A1	100/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
DHU-12	DEHUMID. UNIT #12	ROOFTOP - A1	111.2			3	480	P4S1A1	125/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
AHU-1	AIR HANDLER #1	ROOFTOP - F1	128.48			3	480	P4S1A1	150/3	4#2/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
AHU-2	AIR HANDLER #2	ROOFTOP - F1	64.47			3	480	M4N1A1	80/3	4#3 AWG	1#8 AWG E.G.	1 1/2"C	A	PROVIDE WP	3
AHU-3	AIR HANDLER #3	ROOFTOP - F1	128.48			3	480	P4S1A1	150/3	4#2/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
AHU-4	AIR HANDLER #4	ROOFTOP - F2	75			3	480	P4S1A1	90/3	4#2 AWG	1#8 AWG E.G.	1 1/2"C	A	PROVIDE WP	3
AHU-5	AIR HANDLER #5	ROOFTOP - B	97.72			3	480	M4N2B1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
AHU-6	AIR HANDLER #6	ROOFTOP - A2	94.92			3	480	P4S1A1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
AHU-7	AIR HANDLER #7	ROOFTOP - A2	97.72			3	480	M4N2D1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
AHU-8	AIR HANDLER #8	ROOFTOP - D	94.92			3	480	M4N2D1	110/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
AHU-9	AIR HANDLER #9	ROOFTOP - A1	106.47			3	480	M4N1A1	125/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A	PROVIDE WP	3
HWP-1	HOT WATER PUMP #1	MECH ROOM B057		25		3	480	P4SBB1	60/3	4#4 AWG	1#10 AWG E.G.	1 1/4"C	-	-	3
HWP-2	HOT WATER PUMP #2	MECH ROOM B057		25		3	480	P4SBB1	60/3	4#4 AWG	1#10 AWG E.G.	1 1/4"C	-	-	3
HWP-3	HOT WATER PUMP #3	MECH ROOM B057		3/4		3	480	P4SBB1	20/3	4#12 AWG	1#12 AWG E.G.	3/4"C	-	-	2
HWP-4	HOT WATER PUMP #4	MECH ROOM B057		3/4		3	480	P4SBB1	20/3	4#12 AWG	1#12 AWG E.G.	3/4"C	-	-	2
CP-1	CIRC PUMP #1	CORRIDOR F101 - 2ND FLOOR	3/4			3	480	P4S1A1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
CP-2	CIRC PUMP #2	CORRIDOR F101 - 2ND FLOOR	1/3			1	120	P2S1A1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CP-3	CIRC PUMP #3	CIRCULATION F111 - 2ND FLOOR	3/4			3	480	P4S1A1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
CP-4	CIRC PUMP #4	HEALTH LAB F123	1/3			1	120	P4S1A1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CP-5	CIRC PUMP #5	ARTS & COMMUNICATIONS B220	1/3			1	120	P4S1B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CP-6	CIRC PUMP #6	MAIN COMMONS A220	1/2			1	120	P4S1B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CP-7	CIRC PUMP #7	MAIN COMMONS A220	1/3			1	120	P4S2C1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CP-8	CIRC PUMP #8	EARTH SCIENCE CLASSROOM D237	1/2			1	120	P4S2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CP-9	CIRC PUMP #9	LEARNING CENTER A224	1/3			1	120	P4S2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CP-D6	CIRC PUMP #D6	BUSINESS & MANAGEMENT D220	1/2			1	120	P2S2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
B-1	BOILER #1	MECH ROOM B057	7			3	208	P2SBB2	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
B-2	BOILER #2	MECH ROOM B057	7			3	208	P2SBB2	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
B-3	BOILER #3	MECH ROOM B057	7			3	208	P2SBB2	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
B-4	BOILER #4	MECH ROOM B057	7			3	208	P2SBB2	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
B-5	BOILER #5	MECH ROOM B057	7			3	208	P2SBB2	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
BCU-A100	BLOWER COIL UNIT A100	RECEPTION WAITING A101A		3/4		3	480	P4SBB1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	2
CAF-1	COMBUSTION AIR FAN #1	ROOFTOP - B		1		3	480	P4SBB1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
CAF-2	COMBUSTION AIR FAN #2	ROOFTOP - B		1		3	480	P4SBB1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	-	2
SEF-1	ATRIUM SMOKE EXHAUST FAN #1	ROOFTOP - A2		30		3	480	P4LSB1	70/3	4#2 AWG MI CABLE	-	-	A	PROVIDE WP	3
SEF-2	ATRIUM SMOKE EXHAUST FAN #2	ROOFTOP - A2		30		3	480	P4LSB1	70/3	4#2 AWG MI CABLE	-	-	A	PROVIDE WP	3
SEF-3	ATRIUM SMOKE EXHAUST FAN #3	ROOFTOP - B		25		3	480	P4LSB1	60/3	4#2 AWG MI CABLE	-	-	A	PROVIDE WP	3
SSF-1	SMOKE EXHAUST MAKE-UP #1	ROOFTOP - A2		2		3	480	P4LSB1	20/3	4#6 AWG MI CABLE	-	-	A	PROVIDE WP	3
SSF-2	SMOKE EXHAUST MAKE-UP #2	ROOFTOP - A2		2		3	480	P4LSB1	20/3	4#6 AWG MI CABLE	-	-	A	PROVIDE WP	3
CEF-C110	FUME HOOD FAN	ROOFTOP - C1		3/4		1	120	P2N2C2	25/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
CEF-C114	FUME HOOD FAN	ROOFTOP - C1		3/4		1	120	P2N2C2	25/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
DEF-1	KITCHEN DISHWASHER EXHAUST FAN	ROOFTOP - A2		1/2		1	120	D2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
DEF-2	CULIN. DISHWASHER EXHAUST FAN	ROOFTOP - D		1/2		1	120	D2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-D132	ROOM D132 FAN	ROOFTOP - D		1/4		1	120	D2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-C104C	ROOM C104 FAN	ROOFTOP - A2		1/6		1	120	D2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-B149	ROOM B149 FAN	ROOFTOP - B		3/4		1	120	D2N2B1	25/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-B228A	ROOM B228 FAN	ROOFTOP - B		1/6		1	120	D2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-A193	ROOM A193 FAN	ROOFTOP - B		1/6		1	120	D2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-D146	ROOM D146 FAN	ROOFTOP - D		1/6		1	120	D2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-C223A	ROOM C223 FAN	ROOFTOP - C1		1/6		1	120	P2N2C2	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-D129	ROOM D129 FAN	ROOFTOP - D		1/4		1	120	D2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-D247	ROOM D247 FAN	ROOFTOP - D		1/6		1	120	D2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-E227B	ROOM E227 FAN	ROOFTOP - E		1/4		1	120	P2N2E1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-A174	ROOM A174 FAN	ROOFTOP - A1		1/6		1	120	D2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-D150B	ROOM D150 FAN	TRACTOR INSTRUCTION D150B		1/6		1	120	P2N1D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-A237	ROOM A237 FAN	ROOFTOP - A2		1/6		1	120	P2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-B054	ROOM B054 FAN	ELECTRICAL B054		1/4		1	120	M2NBB1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-B054B	ROOM B054 FAN	ELECTRICAL B054			0.048	1	120	FED WITH EF-B054	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-C121	ROOM C121 FAN	ROOFTOP - C1		1/2		1	120	P2N2C2	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-C134	ROOM C134 FAN	ROOFTOP - C2		1/4		1	120	P2N2C2	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-C202A	ROOM C202 FAN	CAD LAB C202B		1.5		3	208	D2N2C1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	2
EF-E242	ROOM E242 FAN	ROOFTOP - E		2		1	208	D2N2E1	25/2	3#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	2
EF-A108	ROOM A108 FAN	ROOFTOP - A1		1/6		1	120	P2N2E1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-B052	ROOM B052 FAN	MAINTENANCE B052		1/6		1	120	M2NBB1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-B215C	ROOM B215C FAN	ROOFTOP - B		1/10		1	120	P2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-A252	ROOM A252 FAN	ROOFTOP - A2		1/10		1	120	FED WITH EF-B215C	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-A131	ROOM A131 FAN	ROOFTOP - A2		1/10		1	120	P2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
EF-D220	ROOM D220 FAN	ROOFTOP - A2		1/10		1	120	FED WITH EF-A131	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
KEF-1	KITCHEN EXHAUST FAN #1	ROOFTOP - A2		5		3	480	M4N2B1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	2
KEF-2	BAKE LAB EXHAUST FAN #2	ROOFTOP - D		2		3	480	M4N2D1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	2
KEF-3	CULIN. KITCHEN EXHAUST FAN #3	ROOFTOP - D		3		3	480	M4N2D1	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	2
KEF-4	FACS LAB EXHAUST FAN #4	ROOFTOP - D		2		1	208	D2N2D1	25/2	3#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	2
KEF-5	FACS LAB EXHAUST FAN #5	ROOFTOP - D		1/2		1	120	D2N2D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
KEF-6	FACS LAB EXHAUST FAN #6	ROOFTOP - A2		1		1	120	P2N2D1	30/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
KEF-7	ECE KITCHEN EXHAUST FAN #7	ROOFTOP - A1		1/2		1	120	D2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
KEF-8	LS APARTMENT B215 EXHAUST FAN #8	ROOFTOP - B		1/4		1	120	D2N2B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
SF-E242	FIRE DRILL AREA E242 FAN	ROOFTOP - E		1/2		1	120	P2N2E1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	FACTORY	1
DBF-D132C	DRYER BOOSTER FAN D132C	LOCKERS D132C			0.075	1	120	P2N1D2	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C			1
DBF-D112	DRYER BOOSTER FAN D112	FACS CULINARY LAB D112			0.075	1	120	FED WITH DBF-D132C	-	2#10 AWG	1#10 AWG E.G.	3/4"C			1
DBF-D132D	DRYER BOOSTER FAN D132D	LINEN/CLEANING D132D			0.075	1	120	FED WITH DBF-D132C	-	2#10 AWG	1#10 AWG E.G.	3/4"C			1
DBF-C104D	DRYER BOOSTER FAN C104D	CUSTODIAL C104D			0.075	1	120	P2N1C3	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C			1
DBF-E126A	DRYER BOOSTER FAN E126A	STORAGE E126A			0.075	1	120	P2N1E1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C			1
DC-C138	DUST COLLECTOR SYSTEM C138	WELDING FABRICATION C138 - EXTERIOR		30		3	480	P4N1C2	70/3	4#2 AWG	1#8 AWG E.G.	1 1/2"C	A, B	PROVIDE WP	4
DC-C117	DUST COLLECTOR SYSTEM C117	CTE EXPLORATION STUDIO C117 - EXTERIOR		20		3	480	P4N1C2	50/3	4#6 AWG	1#10 AWG E.G.	1"C	A, B	PROVIDE WP	4
DC-134b	DUST COLLECTOR SYSTEM 134b	PRECISION MANUFACTURING C134		1.5		3	480	P4N1C2	20/3	4#10 AWG	1#10 AWG E.G.	3/4"C	A, B	PROVIDE WP	4
DC-134a	DUST COLLECTOR SYSTEM 134a	PRECISION MANUFACTURING C134 - EXTERIOR		7 1/2		3	480	P4N1C2	20/3	4#8 AWG	1#10 AWG E.G.	1"C	A, B	PROVIDE WP	4
DC-C127	DUST COLLECTOR SYSTEM C127	BUILDING TRADES C127 - EXTERIOR		40		3	480	P4N1C2	100/3	4#1/0 AWG	1#6 AWG E.G.	2"C	A, B	PROVIDE WP	4
CUH-1	CAB. UNIT HEATER #1	STAIR B B050		1/10, 1/15		1	120	P2SBB2	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-2	CAB. UNIT HEATER #2	SCIENCE & TECHNOLOGY C120		1/10		1	120	P2S1C1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-3	CAB. UNIT HEATER #3	STAIR C C122		1/10		1	120	FED WITH CUH-2	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-4	CAB. UNIT HEATER #4	CORRIDOR C111		1/10		1	120	FED WITH CUH-2	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-5	CAB. UNIT HEATER #5	STAIR H A155		1/10, 1/15		1	120	P2S1B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-6	CAB. UNIT HEATER #6	STAIR G D148		1/15		1	120	P2S1D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-7	CAB. UNIT HEATER #7	ENTRY VESTIBULE D140A		1/10, 1/15		1	120	P2S1D1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-8	CAB. UNIT HEATER #8	STAIR D D118		1/10		1	120	FED WITH CUH-6	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-9	CAB. UNIT HEATER #9	STAIR E E139		1/10		1	120	P2S1E1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-10	CAB. UNIT HEATER #10	SECURED ENTRY/STAIR F E154		1/10		1	120	FED WITH CUH-9	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-11	CAB. UNIT HEATER #11	SECURE ENTRY A148		1/10		1	120	P2S1A1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-12	CAB. UNIT HEATER #12	STAIR A A175		1/10		1	120	FED WITH CUH-11	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-13	CAB. UNIT HEATER #13	CIRCULATION F1119		1/10		1	120	P2S1A1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-14	CAB. UNIT HEATER #14	VESTIBULE F119A		1/10		1	120	P2S1A1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-15	CAB. UNIT HEATER #15	VESTIBULE F119A		1/10		1	120	FED WITH CUH-14	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-16	CAB. UNIT HEATER #16	CIRCULATION F1119		1/10		1	120	FED WITH CUH-13	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-17	CAB. UNIT HEATER #17	CORRIDOR F128		1/10		1	120	P2S1A1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-18	CAB. UNIT HEATER #18	CORRIDOR F128		1/10		1	120	FED WITH CUH-17	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-19	CAB. UNIT HEATER #19	STAIR B B150		1/10		1	120	P2S1B1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-20	CAB. UNIT HEATER #20	ENTRY 2 A171		1/10, 1/15		1	120	P2S1A1	20/1	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-21	CAB. UNIT HEATER #21	ENTRY 2 A171		1/10, 1/15		1	120	FED WITH CUH-20	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
CUH-22	CAB. UNIT HEATER #22	CIRC. A185A		1/10		1	120	FED WITH CUH-17	-	2#10 AWG	1#10 AWG E.G.	3/4"C	-	-	1
ACC-1	A/C CONDENSER #1	ROOFTOP - D	16			1	208	D2N2D1	20/2	3#10 AWG	1#10 AWG E.G.	3/4"C	A	PROVIDE WP	4
AC-1	AIR COND. #1	DATA D144				1	208	FED THROUGH ACC-1	-	3#10 AWG	1#10 AWG E.G.	3/4"C	A, C	PROVIDE	-
ACC-2	A/C CONDENSER #2	ROOFTOP - C1	16			1	208	D2N2C1	20/2	3#10 AWG	1#10 AWG E.G.	3/4"C	A	PROVIDE WP	4
AC-2	AIR COND. #2	DATA C114A				1	208	FED THROUGH ACC-2	-	3#10 AWG	1#10 AWG E.G.	3/4"C	A, C	PROVIDE	-

6 (revision marker at CAF-2 and HWP-1/HWP-2); 3 (note marker at DC-C138 through DC-C127)

GENERAL NOTES:
1. ALL ACCESSORIES PROVIDED BY THE DIVISION 16 CONTRACTOR. UON
2. ALL CONTROL DEVICES ARE TO BE SURFACE MOUNTED, UNLESS OTHERWISE NOTED.
3. PROVIDE OVERLOADS, SIZE AS REQUIRED, BY THE DIVISION 16 CONTRACTOR
4. IF DIFFERENT THAN INDICATED ON THIS SCHEDULE OR PANELBOARD SCHEDULE, PROVIDE NEW CIRCUIT BREAKER IN DESIGNATED PANELBOARD SIZED PER EQUIPMENT NAMEPLATE DATA.

REFERENCE NOTES:
A. PROVIDE PROPERLY SIZED FUSED DISCONNECT SWITCH (WITH FUSES)
B. PROVIDE DISCONNECT SWITCH AHEAD OF CONTROL PANEL
C. PROVIDE 208V (SINGLE-PHASE) WIRING AND CONNECTIONS FROM THE UNIT TO POWER THE REMOTE CONDENSATE PUMP
D. SHUNT TRIP CKT BKR
E. PROVIDE GFCI RECEPTACLE

CONTROL DEVICES NOTES
1. MANUAL MOTOR STARTER
2. COMBINATION MAGNETIC STARTER
3. VARIABLE SPEED DRIVE *
4. PACKAGED CONTROL UNIT
5. FIRE ALARM FAN SHUT DOWN
6 BOILER SHUTDOWN SWITCH & THERMAL CUTOUT

* SUPPLIED BY MECHANICAL CONTRACTOR, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR

DRAWING NOTES

1 THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.

2 REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.

3 CONTRACTOR SHALL PROVIDE DISCONNECT SWITCH AHEAD OF DUST COLLECTION SYSTEM CONTROL PANEL, AND OUTDOORS AT THE UNIT (WP), SIZED AS REQUIRED. PROVIDE ALL WIRING IN CONDUIT REQUIRED BETWEEN THE CONTROL PANEL AND THE OUTDOOR UNIT (FOR ALL OPTIONS AND ACCESSORIES TO THE SYSTEM). PROVIDE ALL WIRING BETWEEN THE DUST COLLECTION SYSTEM FIRE PANEL AND THE UNIT, AND CONNECTIONS TO THE BUILDING FIRE ALARM PANEL, AS REQUIRED BY THE LOCAL FIRE DEPARTMENT. ANY AND ALL WIRING AND CONNECTIONS SHALL BE PROVIDED FOR A COMPLETE AND OPERATIONAL SYSTEM.

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Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
5	ADDENDUM #5	2016-03-17
6	ADDENDUM #6	2016-03-23

CONTENT:
ELECTRICAL SCHEDULES

DRAWN BY: C. NEWELL
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: NO SCALE

E0.04

Project Phase
BID DOCUMENTS

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FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

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DRAWING NOTES

1 THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.

2 REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.

SWITCHBOARD: MSB-A

BUS SIZE: 3000 AMPS — MAIN: 3000 AMP MCB ELECTRONIC TRIP
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: YES — LOCATION: ELECTRICAL B054
ISOLATED GND BUS: NO — MOUNTING: FLOOR
SHORT CIR. CURRENT RATING 65000 AMPS — TVSS: YES

DIRECTORY	WATTS OF LOAD L1	L2	L3	CKT BKR AMPS	POLES	CKT BKR AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
PANEL L4N1E1	11587	4679	2714	125	1 2 / 3 4 / 5 6	600ET	88672	80744	82148	PANEL D2N1B1 VIA TRANS TB1
PANEL M4N2C1	121882	121882	121882	600ET	7 8 / 9 10 / 11 12	1000ET	145879	140857	133255	PANEL D2N1C1 VIA TRANS TC1
PANEL M4N2B1	87606	87606	87606	400ET	13 14 / 15 16 / 17 18	125	9857	12825	1544	PANEL L4N2B1
PANEL P4N1C6A & B	160230	159034	157602	800ET	19 20 / 21 22 / 23 24	600ET	96959	95573	85489	PANEL D2N1A1 VIA TRANS TA1
PANEL D2N1E1 VIA TRANS TE1	28414	30757	26269	300ET	25 26 / 27 28 / 29 30	300ET	25000	25000	25000	DIMMER RACK DR1 VIA TRANS T-DR
PANEL D2N2C1 VIA TRANS TC2	30700	24770	26828	400ET	31 32 / 33 34 / 35 36	300ET	51914	58090	35108	PANEL D2N2B1 VIA TRANS TB2
PANEL L4N1C1	14414	12850	5103	125	37 38 / 39 40 / 41 42	125	2911	4077	3003	PANEL L4N2C1
PANEL P4LSB1 AND PANEL P2LSB1 VIA ATS-LS	86258	59647	50843	300ET	43 44 / 45 46 / 47 48	125	3410	6166	3262	PANEL L4N1B1
SPARE				400ET	49 50 / 51 52 / 53 54	125	15690	15523	9090	PANEL L4N1A1
SPARE				225ET	55 56 / 57 58 / 59 60	400ET				SPARE
SPARE				225ET	61 62 / 63 64 / 65 66	250				SPACE
SUBTOTAL	541091	501225	478847				440292	438855	377899	SUBTOTAL

NOTES:

TOTAL WATTS L1: 981383
TOTAL WATTS L2: 940080
TOTAL WATTS L3: 856746
TOTAL WATTS: 2778209
TOTAL AMPS @ 100%: 3346 AMPS
TOTAL AMPS @ 125%: 4182 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE
S=SHUNT TRIP — G=GFCI
L=LOCK ON C.B. — H=HACR C.B.
AF=ARC FAULT

SWITCHBOARD: MSB-B

BUS SIZE: 3000 AMPS — MAIN: 3000 AMP MCB ELECTRONIC TRIP
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: YES — LOCATION: ELECTRICAL B054
ISOLATED GND BUS: NO — MOUNTING: FLOOR
SHORT CIR. CURRENT RATING 65000 AMPS — TVSS: YES

DIRECTORY	WATTS OF LOAD L1	L2	L3	CKT BKR AMPS	POLES	CKT BKR AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
PANEL M4N2E1	70225	70225	70225	400ET	1 2 / 3 4 / 5 6	600ET	148996	148996	148996	PANEL M4N2D1
PANEL D4NFF1 FOOTBALL FIELD LIGHTING & STADIUM, ETC.	50563	48888	50278	800ET	7 8 / 9 10 / 11 12	300ET	42128	41625	39344	PANEL D2N2D1 VIA TRANS TD2
PANEL D2N1D1 VIA TRANS TD1	110236	103507	104830	600ET	13 14 / 15 16 / 17 18	250ET	59028	59028	59028	PANEL P4N1C2
PANEL M4N1A1	95756	95756	95756	400ET	19 20 / 21 22 / 23 24	125	23870	17109	14309	PANEL L4N1D1
PANEL P4SBB1 VIA ATS-SP	252651	241312	235128	900ET	25 26 / 27 28 / 29 30	125	7702	3961	5226	PANEL L4N2D1
PANEL D2N2E1 VIA TRANS TE2	27081	26123	26708	300ET	31 32 / 33 34 / 35 36	125	6172	4459	3466	PANEL L4N2E1
PANEL M2NBB1 VIA TRANS T-B	2444	2328	2520	100	37 38 / 39 40 / 41 42	100	14410	14410	14410	LIGHTING CABINET RP2 VIA TRANS T-RP
ELEVATOR #2	9422	9422	9422	60	43 44 / 45 46 / 47 48	400ET				SPARE
SPARE				400ET	49 50 / 51 52 / 53 54	225ET				SPARE
SUBTOTAL	618378	597561	594867				302306	289588	284779	SUBTOTAL

NOTES:

TOTAL WATTS L1: 920684
TOTAL WATTS L2: 887149
TOTAL WATTS L3: 879646
TOTAL WATTS: 2687479
TOTAL AMPS @ 100%: 3236 AMPS
TOTAL AMPS @ 125%: 4045 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE
S=SHUNT TRIP — G=GFCI
L=LOCK ON C.B. — H=HACR C.B.
AF=ARC FAULT

PANELBOARD: P4S1A1

BUS SIZE: 600 AMPS — MAIN: MLO
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELEC F111D
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 18000 AMPS — TVSS: NO

DIRECTORY	WATTS OF LOAD L1	L2	L3	CKT BKR AMPS	POLES	CKT BKR AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
UNIT DHU-12	30817	30817	30817	125	1 2 / 3 4 / 5 6	150	35605	35605	35605	UNIT AHU-1
UNIT AHU-3	35605	35605	35605	150	7 8 / 9 10 / 11 12	90	20785	20785	20785	UNIT AHU-4
UNIT AHU-6	26305	26305	26305	110	13 14 / 15 16 / 17 18	20	443	443	443	CIRC PUMP CP-1
CIRC PUMP CP-3	443	443	443	20	19 20 / 21 22 / 23 24	50				SPARE
SPARE				20	25 26 / 27 28 / 29 30	20				SPARE
LTG - GYM F122	2002			20	31 32	20	2990			LTG - GYM F102
LTG - GYM F122		2772		20	33 34	20		3680		LTG - GYM F102
SPARE				20	35 36	20			4036	LTG - CIRCULATION F119
SPARE				20	37 38	20				SPARE
SPARE				20	39 40	20				SPARE
SPARE				20	41 42	20				SPARE
SUBTOTAL	95172	95942	93170				59823	60513	60869	SUBTOTAL

NOTES:

TOTAL WATTS L1: 154995
TOTAL WATTS L2: 156455
TOTAL WATTS L3: 154039
TOTAL WATTS: 465489
TOTAL AMPS @ 100%: 561 AMPS
TOTAL AMPS @ 125%: 701 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE
S=SHUNT TRIP — G=GFCI
L=LOCK ON C.B. — H=HACR C.B.
AF=ARC FAULT

PANELBOARD: P4SBB1

BUS SIZE: 1000 AMPS — MAIN: MLO
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELECTRICAL B054
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 65000 AMPS — TVSS: NO

DIRECTORY	WATTS OF LOAD L1	L2	L3	CKT BKR AMPS	POLES	CKT BKR AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
PANEL P2SBB1 VIA TRANS ST1	73855	65696	60280	600ET	1 2 / 3 4 / 5 6	500ET	150003	150003	150003	PANEL P4S1A1
PUMP HWP-1 (25HP)	9422	9422	9422	60	7 8 / 9 10 / 11 12	60	9422	9422	9422	PUMP HWP-2 (25HP)
PUMP HWP-3 (2HP)	942	942	942	20	13 14 / 15 16 / 17 18	60	9422	9422	9422	ELEVATOR #1
PUMP HWP-4 (2HP)	942	942	942	20	19 20 / 21 22 / 23 24	20	443 △6	443	443	BLOWER COIL BCU-A100
COMB. AIR FAN CAF-1	582	582	582	20	25 26 / 27 28 / 29 30	20	582	582 △6	582 △6	COMB. AIR FAN CAF-2 △6
SPARE				30	31 32 / 33 34 / 35 36	50				SPARE
SPARE				20	37 38 / 39 40 / 41 42	20				SPARE
SUBTOTAL	85743	77584	72168				169872	169872	169872	SUBTOTAL

NOTES:

TOTAL WATTS L1: 255615
TOTAL WATTS L2: 247456
TOTAL WATTS L3: 242040
TOTAL WATTS: 745111
TOTAL AMPS @ 100%: 897 AMPS
TOTAL AMPS @ 125%: 1122 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE
S=SHUNT TRIP — G=GFCI
L=LOCK ON C.B. — H=HACR C.B.
AF=ARC FAULT

PANELBOARD: P2SBB1

BUS SIZE: 600 AMPS — MAIN: 600 AMP MCB ELECTRONIC TRIP
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELECTRICAL B054
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	WATTS OF LOAD L1	L2	L3	CKT BKR AMPS	POLES	CKT BKR AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
PANEL K2S1A1 (KITCHEN)	15674	12763	12319	225ET	1 2 / 3 4 / 5 6	225ET	13926	11870	12346	PANEL P2S1D2 (CULINARY)
PANEL P2S1A1	8108	5456	6972	60	7 8 / 9 10 / 11 12	60	3180	1720	1776	PANEL P2S1B1
PANEL P2S1C1	8928	7368	6804	100	13 14 / 15 16 / 17 18	60	3140	3840	1884	PANEL P2S1D1
PANEL P2S1E1	2460	1884	1584	60	19 20 / 21 22 / 23 24	60	1164	0	0	PANEL P2S2B1
PANEL P2S2C1	1020	1584	720	60	25 26 / 27 28 / 29 30	60	1020	1896	1896	PANEL P2S2D1
PANEL P2S2E1	1020	720	720	60	31 32 / 33 34 / 35 36	150	11833	11033	6929	PANEL P2SBB2
SPARE				20	37 38 / 39 40 / 41 42	20				SPARE
SUBTOTAL	37210	29775	29119				34263	30359	24831	SUBTOTAL

NOTES:

TOTAL WATTS L1: 71473
TOTAL WATTS L2: 60134
TOTAL WATTS L3: 53950
TOTAL WATTS: 185557
TOTAL AMPS @ 100%: 516 AMPS
TOTAL AMPS @ 125%: 645 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE
S=SHUNT TRIP — G=GFCI
L=LOCK ON C.B. — H=HACR C.B.
AF=ARC FAULT

PANELBOARD: K2S1A1

BUS SIZE: 225 AMPS — MAIN: MLO
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: CORRIDOR C104
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	WATTS OF LOAD L1	L2	L3	CKT BKR AMPS	POLES	CKT BKR AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
COOLER CONDENSING UNIT #14A	709	709	709	20	1 2 / 3 4 / 5 6	20	1729	1729	1729	FREEZER COND. UNIT #14C
COOLER CONDENSING UNIT #14A	709	709	709	20	7 8 / 9 10 / 11 12	20	1729	1729	1729	FREEZER COND. UNIT #14C
SPARE				20	13 14	20	1238			FREEZER EVAP COIL #14D
					15 16			1238		
					17 18	20			1238	FREEZER EVAP COIL #14D
REFRIGERATED GRAB-N-GO #82	1225			20	19 20		1238			
		1225			21 22	20				SPARE
REFRIGERATED GRAB-N-GO #82			1225	20	23 24					
	1225				25 26	20G	1300			WALK-IN COOLER LIGHTS #12
COOLER EVAP COIL #14B		240		20G	27 28	20G		1500		WALK-IN FREEZER LIGHTS #13A
COOLER EVAP COIL #14B			240	20G	29 30	20G			1500	WALK-IN FREEZ HEAT TRACE #13B
VENT. CONTROL SYSTEM #42	1500			20G	31 32	20G	1032			PASS-THRU REFRIGERATOR #56
FIRE SUPPRESSION SYSTEM #43		1500		20G	33 34	20G		984		REACH IN REFRIGERATOR #58
REFRIGERATED GRAB-N-GO #65			840	20G	35 36	20G			1200	CASHIER TERMINAL #85
REFRIGERATED GRAB-N-GO #65	840			20G	37 38	20G	1200			CASHIER TERMINAL #85
SPARE				20G	39 40	20G		1200		CASHIER TERMINAL #85
SPARE				20G	41 42	20G			1200	CASHIER TERMINAL #85
SPARE				20G	43 44	20G				SPARE
SPARE				20G	45 46	20G				SPARE
SPARE				20G	47 48	15G				SPARE
SPARE				20G	49 50	15G				SPARE
SPARE				20G	51 52	15G				SPARE
SPARE				20G	53 54	15G				SPARE
SUBTOTAL	6208	4383	3723				9466	8380	8596	SUBTOTAL

NOTES:

TOTAL WATTS L1: 15674
TOTAL WATTS L2: 12763
TOTAL WATTS L3: 12319
TOTAL WATTS: 40756
TOTAL AMPS @ 100%: 113 AMPS
TOTAL AMPS @ 125%: 142 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE
S=SHUNT TRIP — G=GFCI
L=LOCK ON C.B. — H=HACR C.B.
AF=ARC FAULT

FUSED PANELBOARD: P4LSB1

BUS SIZE: 225 AMPS — MAIN: MLO — SURGE SUPPRESSION
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: EMERG ELEC B054B
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 65000 AMPS — TVSS: YES

DIRECTORY	WATTS OF LOAD L1	L2	L3	FUSE AMPS	POLES	FUSE AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
ATRIUM MAKE-UP FAN SSF-2	942	942	942	20	1 2 / 3 4 / 5 6	40	11363	830	3489	PANEL P4LS1A1
PANEL P4LS1B1	3587	3288	246	40	7 8 / 9 10 / 11 12	40	6786	2889	2960	PANEL P4LS1C1
PANEL P4LS1D1	5032	994	1129	40	13 14 / 15 16 / 17 18	40	3387	1006	167	PANEL P4LS1E1
PANEL P4LS2B1	2880	2362	911	40	19 20 / 21 22 / 23 24	40	2191	2362	911	PANEL P4LS2C1
PANEL P4LS2D1	2648	886	0	40	25 26 / 27 28 / 29 30	40	3254	0	0	PANEL P4LS2E1
ATRIUM EXH FAN SEF-1	11085	11085	11085	70	31 32 / 33 34 / 35 36	70	11085	11085	11085	ATRIUM EXH FAN SEF-2
ATRIUM EXH FAN SEF-3	9422	9422	9422	60	37 38 / 39 40 / 41 42	20	942	942	942	ATRIUM MAKE-UP AIR FAN SSF-1
SUBTOTAL	35596	28979	23735				39008	19114	19554	SUBTOTAL

NOTES:

TOTAL WATTS L1: 74604
TOTAL WATTS L2: 48093
TOTAL WATTS L3: 43289
TOTAL WATTS: 165986
TOTAL AMPS @ 100%: 200 AMPS
TOTAL AMPS @ 125%: 250 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

FUSED PANELBOARD: P2LSB1

BUS SIZE: 225 AMPS — MAIN: 225 AMP MF — SURGE SUPPRESSION
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: EMERG ELEC B054B
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: YES

DIRECTORY	WATTS OF LOAD L1	L2	L3	FUSE AMPS	POLES	FUSE AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
CABINET RP1 VIA ATS	8000	8000	8000	100	1 2 / 3 4 / 5 6	100	10900	11200	8200	PANEL P2LS1B1
SMCP - ELECTRICAL B054	1200			20	7 8	20	200			JUNCTION - MAG. HOLD - B051
FACP - ELECTRICAL B054		1500		20	9 10	20				SPARE
ELEVATOR #1 CAB LIGHTS - A214A			500	20	11 12	20				SPARE
ELEVATOR #2 CAB LIGHTS - A165	500			20	13 14	20				SPARE
SPARE				20	15 16	20				SPARE
SPARE				20	17 18	20				SPARE
SPARE				20	19 20	20				SPARE
SPARE				20	21 22	20				SPARE
SPARE				20	23 24	20				SPARE
SUBTOTAL	9700	9500	8500				11100	11200	8200	SUBTOTAL

NOTES:

TOTAL WATTS L1: 20800
TOTAL WATTS L2: 20700
TOTAL WATTS L3: 16700
TOTAL WATTS: 58200
TOTAL AMPS @ 100%: 162 AMPS
TOTAL AMPS @ 125%: 202 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

PANELBOARD: P2SBB2

BUS SIZE: 150 AMPS — MAIN: MLO
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELECTRICAL B054
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	WATTS OF LOAD L1	L2	L3	CKT BKR AMPS	POLES	CKT BKR AMPS	WATTS OF LOAD L1	L2	L3	DIRECTORY
BOILER B-1	841	841	841	20	1 2 / 3 4 / 5 6	20	841	841	841	BOILER B-2
BOILER B-3	841	841	841	20	7 8 / 9 10 / 11 12	20	841	841	841	BOILER B-4
BOILER B-5	841	841	841	20	13 14 / 15 16 / 17 18	20	288	288	288	PUMP PP-1
GENERATOR BLOCK HEATER	1500	1500		20	19 20 / 21 22	20				SPARE
SPARE				20	23 24 / 25 26	20	1500			GENERATOR BATTERY CHARGER
		1200		20	27 28			1500		
ACP - TELECOM B056										
POWER SUPPLY PS2 - CIRC B051			300	20	29 30	20			360	QUAD RECEP - TELECOM B056
HEATER CUH-1	500			20	31 32	20	360			QUAD RECEP - TELECOM B056
HEATERS PUH-1 & 2		600		20	33 34	20		360		QUAD RECEP - TELECOM B056
HEATERS PUH-3 & 4			600	20	35 36	20			360	QUAD RECEP - TELECOM B056
GENERATOR LIGHTS & RECEP	1500			20	37 38	20	1200			GEN LOAD BANK STRIP HEATER(S)
RECEP - ELECT ROOM B054		540		20	39 40	20		360		QUAD RECEP - TELECOM B056
PUMP PP-2			456	20	41 42	20			360	QUAD RECEP - TELECOM B056
WATER HEATER DWH-1	480			20	43 44	20	300			BAS PANEL - MECH B057
WATER HEATER DWH-2		480		20	45 46	20				SPARE
SPARE				20	47 48	20				SPARE
SPARE				20	49 50	20				SPARE
SPARE				20	51 52	20				SPARE
SPARE				20	53 54	20				SPARE
SUBTOTAL	6503	6843	3879				5330	4190	3050	SUBTOTAL

NOTES:

STANDBY POWER

TOTAL WATTS L1: 11833
TOTAL WATTS L2: 11033
TOTAL WATTS L3: 6929
TOTAL WATTS: 29795
TOTAL AMPS @ 100%: 83 AMPS
TOTAL AMPS @ 125%: 104 AMPS
TOTAL PANEL RECPT LOAD = 540 WATTS

C.B. TYPE
S=SHUNT TRIP — G=GFCI
L=LOCK ON C.B. — H=HACR C.B.
AF=ARC FAULT

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Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
3	ADDENDUM #3	2016-03-04
5	ADDENDUM #5	2016-03-17
6	ADDENDUM #6	2016-03-23

FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

CONTENT:
PANELBOARD SCHEDULES

DRAWN BY: C. NEWELL
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: NO SCALE

E0.07

Project Phase
BID DOCUMENTS

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DRAWING NOTES

1 THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.

2 REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.

PANELBOARD: P4N1C6A

BUS SIZE: 800 AMPS — MAIN: 800 AMP MCB ELECTRONIC TRIP (SHUNT-TRIP)
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: WELDING STORAGE C138D
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	5500				1	2		5500			
WELDING STATION #1 - C138		5500		30	3	4	30		5500		WELDING STATION #2 - C138
			5500		5	6				5500	
	5500				7	8		5500			
WELDING STATION #3 - C138		5500		30	9	10	30		5500		WELDING STATION #4 - C138
			5500		11	12				5500	
	5500				13	14		5500			
WELDING STATION #5 - C138		5500		30	15	16	30		5500		WELDING STATION #6 - C138
			5500		17	18				5500	
	5500				19	20		5500			
WELDING STATION #7 - C138		5500		30	21	22	30		5500		WELDING STATION #8 - C138
			5500		23	24				5500	
	5500				25	26		5500			
WELDING STATION #9 - C138		5500		30	27	28	30		5500		WELDING STATION #10 - C138
			5500		29	30				5500	
	5500				31	32		5500			
WELDING STATION #11 - C138		5500		30	33	34	30		5500		WELDING STATION #12 - C138
			5500		35	36				5500	
	5500				37	38		5500			
WELDING STATION #13 - C138		5500		30	39	40	30		5500		WELDING STATION #14 - C138
			5500		41	42				5500	
	5500				43	44		5500			
WELDING STATION #15 - C138		5500		30	45	46	30		5500		WELDING STATION #16 - C138
			5500		47	48				5500	
	5500				49	50		5500			
WELDING STATION #17 - C138		5500		30	51	52	30		5500		WELDING STATION #18 - C138
			5500		53	54				5500	
SUBTOTAL	49500	49500	49500					49500	49500	49500	SUBTOTAL

NOTES: FEED-THRU LUGS

TOTAL WATTS L1: 160230
TOTAL WATTS L2: 159034
TOTAL WATTS L3: 157602
TOTAL WATTS: 476866
TOTAL AMPS @ 100%: 574 AMPS
TOTAL AMPS @ 125%: 718 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: P4N1C6B

BUS SIZE: 800 AMPS — MAIN: MLO
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: WELDING STORAGE C138D
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	5500				1	2		13948			
WELDING STATION #19 - C138		5500		30	3	4	150		12752		PANEL P2N1C6
			5500		5	6				11320	VIA TRANS T-C6
	5500				7	8		5500			
WELDING STATION #20 - C138		5500		30	9	10	30		5500		CARBON ARC WELDER - C138
			5500		11	12				5500	
	7482				13	14		5500			
SIR BENZALOT - C138		7482		100	15	16	30		5500		POWER SHEAR - C138
			7482		17	18				5500	
	6800				19	20		5500			
SPOT WELDER - C138		6800		45	21	22	30		5500		PLASMA TORCH - C138
			6800		23	24				5500	
	5500				25	26					
COMB. WELDER - C138		5500		30	27	28	30				SPARE
			5500		29	30					
					31	32					
SPARE				20	33	34	20				SPARE
					35	36					
					37	38					
SPARE				20	39	40	30				SPARE
					41	42					
					43	44					
SPARE				30	45	46	50				SPARE
					47	48					
					49	50					
SPARE				50	51	52	60				SPARE
					53	54					
SUBTOTAL	30782	30782	30782					30448	29252	27820	SUBTOTAL

NOTES:

TOTAL WATTS L1: 61230
TOTAL WATTS L2: 60034
TOTAL WATTS L3: 58602
TOTAL WATTS: 179866
TOTAL AMPS @ 100%: 217 AMPS
TOTAL AMPS @ 125%: 271 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: P2N1C8

BUS SIZE: 400 AMPS — MAIN: 400 AMP MCB ELECTRONIC TRIP (SHUNT-TRIP)
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: PREC. MANUFACTURING C134
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	3002				1	2		11020			
HAAS MINI MILL - C134		3002		40	3	4	150		10320		PANEL P2N1C8A
			3002		5	6				11040	
	1200				7	8		1200			
METAL LATHE BUS DROP - C134		1200		20	9	10	20		1200		METAL LATHE BUS DROP - C134
			1200		11	12				1200	
	1200				13	14		1200			
METAL LATHE BUS DROP - C134		1200		20	15	16	20		1200		METAL LATHE BUS DROP - C134
			1200		17	18				1200	
	1200				19	20		1200			
METAL LATHE BUS DROP - C134		1200		20	21	22	20		1200		METAL LATHE BUS DROP - C134
			1200		23	24				1200	
	1200				25	26		1200			
METAL LATHE BUS DROP - C134		1200		20	27	28	20		1200		METAL LATHE BUS DROP - C134
			1200		29	30				1200	
	1200				31	32		1200			
METAL LATHE BUS DROP - C134		1200		20	33	34	20		1200		METAL LATHE BUS DROP - C134
			1200		35	36				1200	
	1200				37	38		1200			
METAL LATHE BUS DROP - C134		1200		20	39	40	20		1200		MILLING MACH. BUS DROP - C134
			1200		41	42				1200	
	1200				43	44		1200			
MILLING MACH. BUS DROP - C134		1200		20	45	46	20		1200		MILLING MACH. BUS DROP - C134
			1200		47	48				1200	
	1200				49	50		1200			
MILLING MACH. BUS DROP - C134		1200		20	51	52	20		1200		MILLING MACH. BUS DROP - C134
			1200		53	54				1200	
	1200				55	56		3699			
MILLING MACH. BUS DROP - C134		1200		20	57	58	60		3699		AIR COMPRESSOR PAC-2
			1200		59	60				3699	
	1200				61	62					
MILLING MACH. BUS DROP - C134		1200		20	63	64	20				SPARE
			1200		65	66					
					67	68					
SPARE				20	69	70	20				SPARE
					71	72					
SPARE				20	73	74	20				SPARE
					75	76					
OVERHEAD DOOR - C134			864	20	77	78	20			1200	DRYER RAD-2
SHUNT-TRIP POWER	100			20	79	80	20				SPARE
SPARE				20	81	82	20				SPARE
SPARE				20	83	84	20				SPARE
SUBTOTAL	15102	15002	15866					24319	23619	25539	SUBTOTAL

NOTES:

TOTAL WATTS L1: 39421
TOTAL WATTS L2: 38621
TOTAL WATTS L3: 41405
TOTAL WATTS: 119447
TOTAL AMPS @ 100%: 332 AMPS
TOTAL AMPS @ 125%: 415 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: P2N1C9

BUS SIZE: 225 AMPS — MAIN: 225 AMP MCB ELECTRONIC TRIP (SHUNT-TRIP)
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: CTE EXPLORATION STUDIO C117
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	2500				1	2					
WELDER - C117		2500		50	3	4	20				SPARE
			2500		5	6					
					7	8		1200			
SPARE				20	9	10	20		1200		JOINTER BUS DROP - C117
					11	12				1200	
SPARE				50	13	14		1200			
					15	16	20		1200		PLANER BUS DROP - C117
SPARE				20	17	18				1200	
					19	20		1200			
SPARE				20	21	22	20		1200		TABLE SAW BUS DROP - C117
					23	24				1200	
IWB RECEP - INSTRUCTION C117A	300			20	25	26	20	720			RECEP - OFFICE C119
RECEP - INSTRUCTION C117A		720		20	27	28	20		360		RECEP - FINISHING C121
RECEP - INSTRUCTION C117A			720	20	29	30	20				SPARE
OVERHEAD DOOR - C117	862			20	31	32	20				SPARE
DROP CORDS - C117		360		20G	33	34	20		1000		SCROLL SAW - C117
DROP CORDS - C117			360	20G	35	36	20			1000	BENCH TOP SANDER - C117
MITER BENCH - C117	1000			20	37	38	20	1000			GRINDER - C117
MITER BENCH - C117		1000		20	39	40	20		540		RECEP - STUDIO C117
ROUTER TABLE - C117			1000	20	41	42	20			720	RECEP - STUDIO C117
DRILL PRESS - C117	1000			20	43	44	20	1000			SCROLL SAW - C117
BAND SAW - C117		1000		20	45	46	25		1656		FILTER AFF-C117a
BAND SAW - C117			1000	20	47	48	25			1656	FILTER AFF-C117b
SHUNT-TRIP POWER	100			20	49	50	20	1000			LATHE BUS DROP - C117
DUST COLLECTION FIRE PANEL		300		20	51	52	20		1000		LATHE BUS DROP - C117
HEAT TRACE - C117 - 2ND FLOOR			400	20	53	54	20				SPARE
SUBTOTAL	5762	5880	5980					7320	8156	6976	SUBTOTAL

NOTES:

TOTAL WATTS L1: 13082
TOTAL WATTS L2: 14036
TOTAL WATTS L3: 12956
TOTAL WATTS: 40074
TOTAL AMPS @ 100%: 111 AMPS
TOTAL AMPS @ 125%: 139 AMPS
TOTAL PANEL RECPT LOAD = 4500 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: P2N1C10

BUS SIZE: 225 AMPS — MAIN: MLO
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: RESIDENTIAL WIRING C113
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	6000				1	2					
PANEL P2N1C10A		6000		150	3	4	60				SPARE
			4800		5	6					
					7	8					
SPARE				30	9	10	20				SPARE
					11	12					
RECEP - OFFICE C115	720			20	13	14	20	300			IWB RECEP - INSTRUCTION C113A
RECEP - WW RES WIRING C113		540		20	15	16	20		720		RECEP - INSTRUCTION C113A
RECEP - WW RES WIRING C113			540	20	17	18	20			720	RECEP - INSTRUCTION C113A
RECEP - WW RES WIRING C113	540			20	19	20	20	720			RECEP -MAT'L STORAGE C113B
RECEP - WW RES WIRING C113		540		20	21	22	20		360		RECEP - WORKBENCH C113
RECEP - WW RES WIRING C113			540	20	23	24	20			360	RECEP - WORKBENCH C113
RECEP - RES WIRING C113	720			20	25	26	20G	360			DROP CORDS - RES WIRING C113
RECEP - RES WIRING C113		540		20	27	28	20G		360		DROP CORDS - RES WIRING C113
SPARE				20	29	30	20				SPARE
SPARE				20	31	32	20				SPARE
SPARE				20	33	34	20				SPARE
SPARE				20	35	36	20				SPARE
SPARE				20	37	38	20				SPARE
SPARE				20	39	40	20				SPARE
SPARE				20	41	42	20				SPARE
SUBTOTAL	7980	7620	5880					1380	1440	1080	SUBTOTAL

NOTES:

TOTAL WATTS L1: 9360
TOTAL WATTS L2: 9060
TOTAL WATTS L3: 6960
TOTAL WATTS: 25380
TOTAL AMPS @ 100%: 71 AMPS
TOTAL AMPS @ 125%: 88 AMPS
TOTAL PANEL RECPT LOAD = 8280 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: L4N1A1

BUS SIZE: 125 AMPS — MAIN: MLO
VOLTAGE: 480 Y/277V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELEC A174
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 18000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	4365				1	2		4365			
480-VOLT RIGGING POWER - A183		4365		20	3	4	20		4365		480-VOLT RIGGING POWER - A183
			4365		5	6				4365	
					7	8	20	432			LTG - EXTERIOR BLDG A3,F2,F1
SPARE				20	9	10	20		3577		LTG - CORRIDOR F101
					11	12	20				SPARE
LTG - MAIN COMMONS A120	3621			20	13	14	20				SPARE
LTG - LIB RESOURCE A127		3216		20	15	16	20				SPARE
LTG - STAIR A			360	20	17	18	20				SPARE
LTG - WRESTLING F126	2907			20	19	20	20				SPARE
SPARE				20	21	22	20				SPARE
SPARE				20	23	24	20				SPARE
SUBTOTAL	10893	7581	4725					4797	7942	4365	SUBTOTAL

NOTES:

TOTAL WATTS L1: 15690
TOTAL WATTS L2: 15523
TOTAL WATTS L3: 9090
TOTAL WATTS: 40303
TOTAL AMPS @ 100%: 49 AMPS
TOTAL AMPS @ 125%: 61 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: D2N1A1

BUS SIZE: 800 AMPS — MAIN: 800 AMP MCB ELECTRONIC TRIP
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELEC A174
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	11018				1	2		13050			
PANEL P2N1A1		11586		125	3	4	125		13110		PANEL P2N1A2
			9262		5	6				10620	
	7380				7	8		9090			
PANEL P2N1A3		7920		125	9	10	125		9140		PANEL P2N1A4
			6780		11	12				9900	
	22884				13	14		13570			
PANEL P2N1A5		22720		225ET	15	16	150ET		12670		PANEL P2N1A6
			22560		17	18				9180	
	19967				19	20					
PANEL P2N1A7		18427		225ET	21	22	125				SPARE
			17187		23	24					
					25	26					
SPARE				60	27	28	50				SPARE
					29	30					
SUBTOTAL	61249	60653	55789					35710	34920	29700	SUBTOTAL

NOTES:

TOTAL WATTS L1: 96959
TOTAL WATTS L2: 95573
TOTAL WATTS L3: 85489
TOTAL WATTS: 278021
TOTAL AMPS @ 100%: 773 AMPS
TOTAL AMPS @ 125%: 966 AMPS
TOTAL PANEL RECPT LOAD = 0 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: P2N1A1

BUS SIZE: 125 AMPS — MAIN: MLO
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELEC A174
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
	2402				1	2					
FUTURE UPS UNIT		2402		30	3	4	30				SPARE
			2402		5	6					(FUTURE UPS)
RECEP - CONCESSIONS A178A	720			20	7	8	20	540			RECEP - ELECT ROOM A174
RECEP - IT OFFICE A182		720		20	9	10	20		540		RECEP - STORAGE ROOM A176
QUAD RECEP -IT OFFICE A182			360	20	11	12	20			180	RECEP - USB - WORKROOM A184
QUAD RECEP -IT OFFICE A182	360			20	13	14	20	180			RECEP - USB - WORKROOM A184
RECEP - IT SERVER/DATA A184A		540		20	15	16	20		180		RECEP - USB - WORKROOM A184
RECEP - IT SERVER/DATA A184A			540	20	17	18	20			180	RECEP - USB - WORKROOM A184
RECEP - IT SERVER/DATA A184A	540			20	19	20	20	180			RECEP - USB - WORKROOM A184
QUAD REC - IT SERV/DATA A184A		1080		20	21	22	20		180		RECEP - USB - WORKROOM A184
QUAD REC - IT SERV/DATA A184A			1080	20	23	24	20			180	RECEP - USB - WORKROOM A184
QUAD REC - IT SERV/DATA A184A	1080			20	25	26	20	180			RECEP - USB - WORKROOM A184
UPS RECEP - IT SERV/DATA A184A		1200		30	27	28	20		180		RECEP - USB - WORKROOM A184
UPS RECEP - IT SERV/DATA A184A			1200	30	29	30	20			180	RECEP - USB - WORKROOM A184
UPS RECEP - IT SERV/DATA A184A	1200			30	31	32	20	180			RECEP - USB - WORKROOM A184
UPS RECEP - IT SERV/DATA A184A		1200		30	33	34	20		180		RECEP - USB - WORKROOM A184
UPS RECEP - IT SERV/DATA A184A			1200	30	35	36	20			180	RECEP - USB - WORKROOM A184
UPS RECEP - IT SERV/DATA A184A	1200			30	37	38	20	180			RECEP - USB - WORKROOM A184
UPS RECEP - IT SERV/DATA A184A		1200		30	39	40	20		400		ELEVATOR #2 - RECEP & LIGHT
LCD - DINING A151			300	30	41	42	20			200	EMR RECEP & LIGHT - A165
RECEP - DINING A151	900			30	43	44	20	1176			ELEVATOR SUMP PUMP SP-2
RECEP - DINING A151		720		30	45	46	20		864		OVERHEAD DOOR - CAFÉ A178
RECEP - CAN WASH A152			1080	20	47	48	20				SPARE
SPARE				20	49	50	20				SPARE
SPARE				20	51	52	20				SPARE
SPARE				20	53	54	20				SPARE
SUBTOTAL	8402	9062	8162					2616	2524	1100	SUBTOTAL

NOTES:

TOTAL WATTS L1: 11018
TOTAL WATTS L2: 11586
TOTAL WATTS L3: 9262
TOTAL WATTS: 31866
TOTAL AMPS @ 100%: 89 AMPS
TOTAL AMPS @ 125%: 111 AMPS
TOTAL PANEL RECPT LOAD = 10800 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

PANELBOARD: P2N1A2

BUS SIZE: 125 AMPS — MAIN: MLO
VOLTAGE: 208 Y/120V 3PH,4W — NEUTRAL: 100%
SERVICE RATED: NO — LOCATION: ELEC A174
ISOLATED GND BUS: NO — MOUNTING: SURFACE
SHORT CIR. CURRENT RATING 22000 AMPS — TVSS: NO

DIRECTORY	L1	L2	L3	CKT BKR AMPS	POLES	POLES	CKT BKR AMPS	L1	L2	L3	DIRECTORY
RECEP - CHILDHOOD ED A143	720			20	1	2	30	3250			DRYER RECEP - KITCHEN A143A
RECEP - CHILDHOOD ED A143		360		20	3	4			3250		
RECEP - CHILDHOOD ED A143			360	20	5	6	20G			1500	WASHER RECEP - KITCHEN A143A
RECEP - CHILDHOOD ED A143	360			20	7	8	20G	1500			DISHWASHER - ECE KITCH A143A
LCD - CHILDHOOD ED A143		300		20	9	10	20G		1500		REFRIG. - ECE KITCH A143A
RECEP - TOILET A145			720	20	11	12	20G			1500	FREEZER - ECE KITCH A143A
IWB RECEP - LIBRARY CONF A160	300			20	13	14	20	360			RECEP - ECE KITCHEN A143A
RECEP - LIBRARY CONF A160		720		20	15	16	20		1500		CNTR RECEP - ECE KITCH A143A
LCD - LIBRARY CONF A160			300	20	17	18	20			1000	RANGE RECEP - ECE KITCH A143A
FLOOR BOX A3 - LIBR CONF A160	360			20	19	20	20	720			RECEP - LIBR OFFICE A125
RECEP - WORK ROOM A123		360		20	21	22	20		180		RECEP - LIBR OFFICE A125
RECEP - WORK ROOM A123			540	20	23	24	20			300	IWB RECEP - LIBR RESOUR A127
COPIER - WORK ROOM A123	1500			20	25	26	20	540			RECEP - LIBR RESOURCE A127
RECEP - TOILET A164		720		20	27	28	20		720		RECEP - LIBR RESOURCE A127
RECEP - CORRIDOR A170			1260	20	29	30	20			540	RECEP - EXTERIOR PLAYGROUND
LCD - CORRIDOR A170	300			20	31	32	20	540			RECEP - EXTERIOR - ENTRY A171
REFRIGERATOR - CAFÉ A178		1500		20G	33	34	20		500		JUNCTION - HOOD - A143A
REFRIGERATOR - CAFÉ A178			1500	20G	35	36	20				SPARE
REFRIGERATOR - CAFÉ A178	1500			20G	37	38	20				SPARE
RECEPTACLES - CAFÉ A178		1500		20	39	40	20				SPARE
MICROWAVE - CAFÉ A178			1100	20	41	42	20				SPARE
MICROWAVE - CAFÉ A178	1100			20	43	44	20				SPARE
SPARE				20	45	46	20				SPARE
SPARE				20	47	48	20				SPARE
SPARE				20	49	50	20				SPARE
SPARE				20	51	52	20				SPARE
SPARE				20	53	54	20				SPARE
SUBTOTAL	6140	5460	5780					6910	7650	4840	SUBTOTAL

NOTES:

TOTAL WATTS L1: 13050
TOTAL WATTS L2: 13110
TOTAL WATTS L3: 10620
TOTAL WATTS: 36780
TOTAL AMPS @ 100%: 102 AMPS
TOTAL AMPS @ 125%: 128 AMPS
TOTAL PANEL RECPT LOAD = 11220 WATTS

C.B. TYPE: S=SHUNT TRIP, G=GFCI, L=LOCK ON C.B., H=HACR C.B., AF=ARC FAULT

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STATE OF MAINE — CHRISTOPHER M. SHUMWAY — No. 10820 — LICENSED PROFESSIONAL ENGINEER

Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23

CONTENT: PANELBOARD SCHEDULES

DRAWN BY: C. NEWELL
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: NO SCALE

E0.10

Project Phase: BID DOCUMENTS

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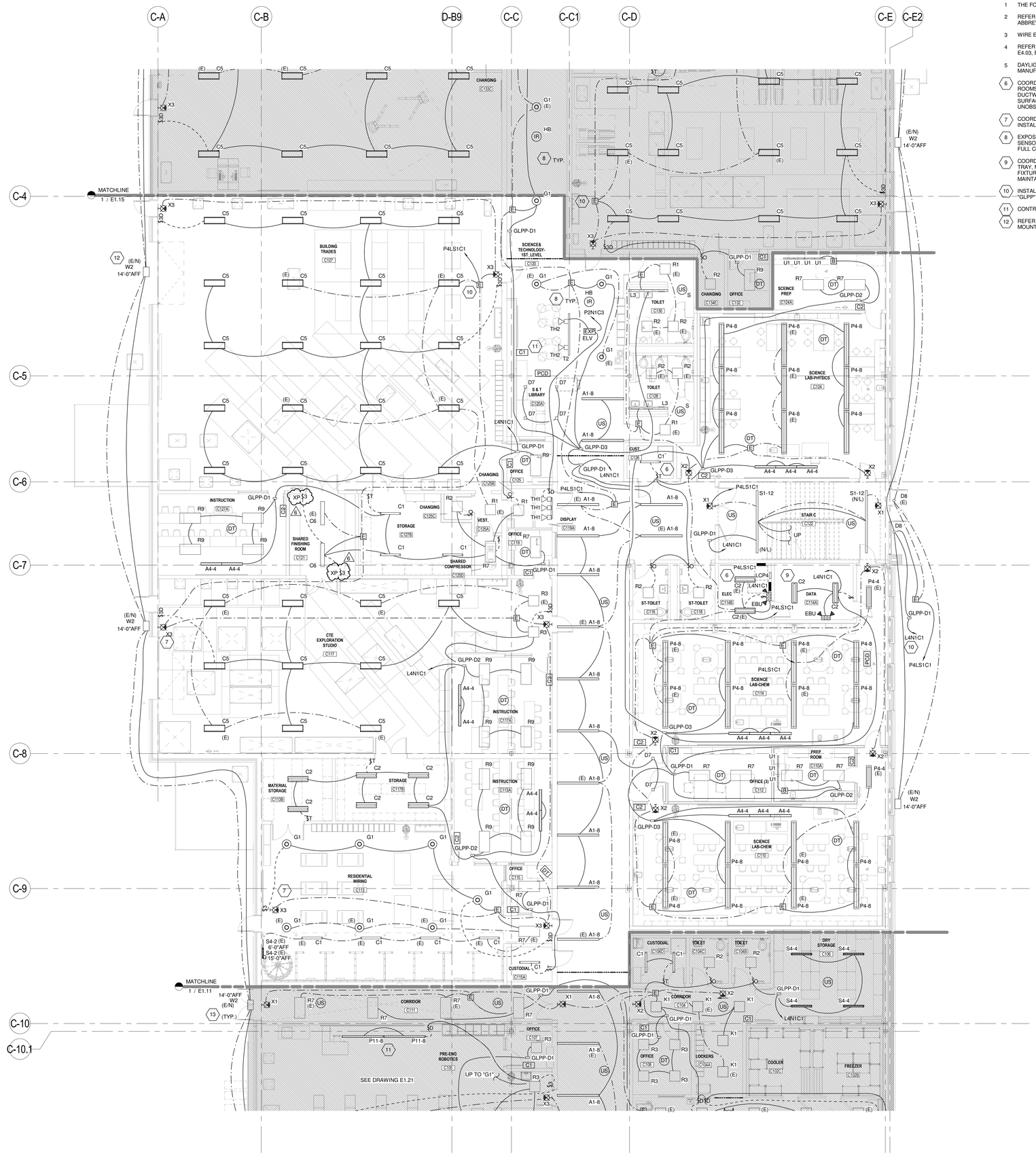

1 LEVEL 1 - LIGHTING PLAN - AREA C1
1/8" = 1'-0"

DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.
3. WIRE EXIT SIGNS AND EMERGENCY WALL PACKS AHEAD OF ALL SWITCHING.
4. REFER TO LIGHTING CONTROL DETAILS AND DIAGRAMS ON SHEETS E4.02, E4.03, E4.04, AND E4.05.
5. DAYLIGHT HARVESTING PHOTOCELLS "PCD" SHALL BE MOUNTED PER MANUFACTURERS RECOMMENDATIONS.
6. COORDINATE MOUNTING OF FIXTURE TYPE "C1-8" AND "C2-8" IN MECHANICAL ROOMS, ELECTRIC ROOM AND STORAGE ROOMS WITH MECHANICAL DUCTWORK AND PIPING PRIOR TO INSTALLATION. FIXTURES SHALL BE SURFACE OF CHAIN HUNG AS HIGH AS POSSIBLE WHILE MAINTAINING AN UNOBSTRUCTED PATH OF ILLUMINATION TO THE FLOOR.
7. COORDINATE MOUNTING OF EXIT SIGN WITH ARCHITECT PRIOR TO INSTALLATION.
8. EXPOSED CEILING - PENDANT MOUNT HIGH BAY INFRARED OCCUPANCY SENSORS TO BOTTOM MECHANICAL DUCT, PIPING AND LIGHT FIXTURES FOR FULL COVERAGE.
9. COORDINATE MOUNTING OF FIXTURE TYPE "C2-8" IN DATA ROOM, WITH CABLE TRAY, MECHANICAL DUCTWORK AND PIPING PRIOR TO INSTALLATION. FIXTURES SHALL BE SURFACE OF CHAIN HUNG AS HIGH AS POSSIBLE WHILE MAINTAINING AN UNOBSTRUCTED PATH OF ILLUMINATION TO THE FLOOR.
10. INSTALL UL924 "E" EMERGENCY TRANSFER DEVICE AND LIGHTING CONTROL "GLPP" DEVICE AIN ACCESSIBLE CEILING.
11. CONTROLS TRACK FIXTURES TH2.
12. REFER TO ARCHITECTURAL ELEVATIONS AND DETAILS FOR BUILDING MOUNTED EXTERIOR LIGHTING LOCATIONS AND MOUNTING HEIGHTS.

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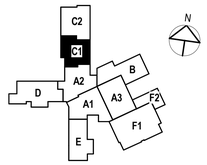
NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23



CONTENT:
FIRST FLOOR LIGHTING PLAN - AREA C1

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/8" = 1'-0"

E1.14

Project Phase
BID DOCUMENTS

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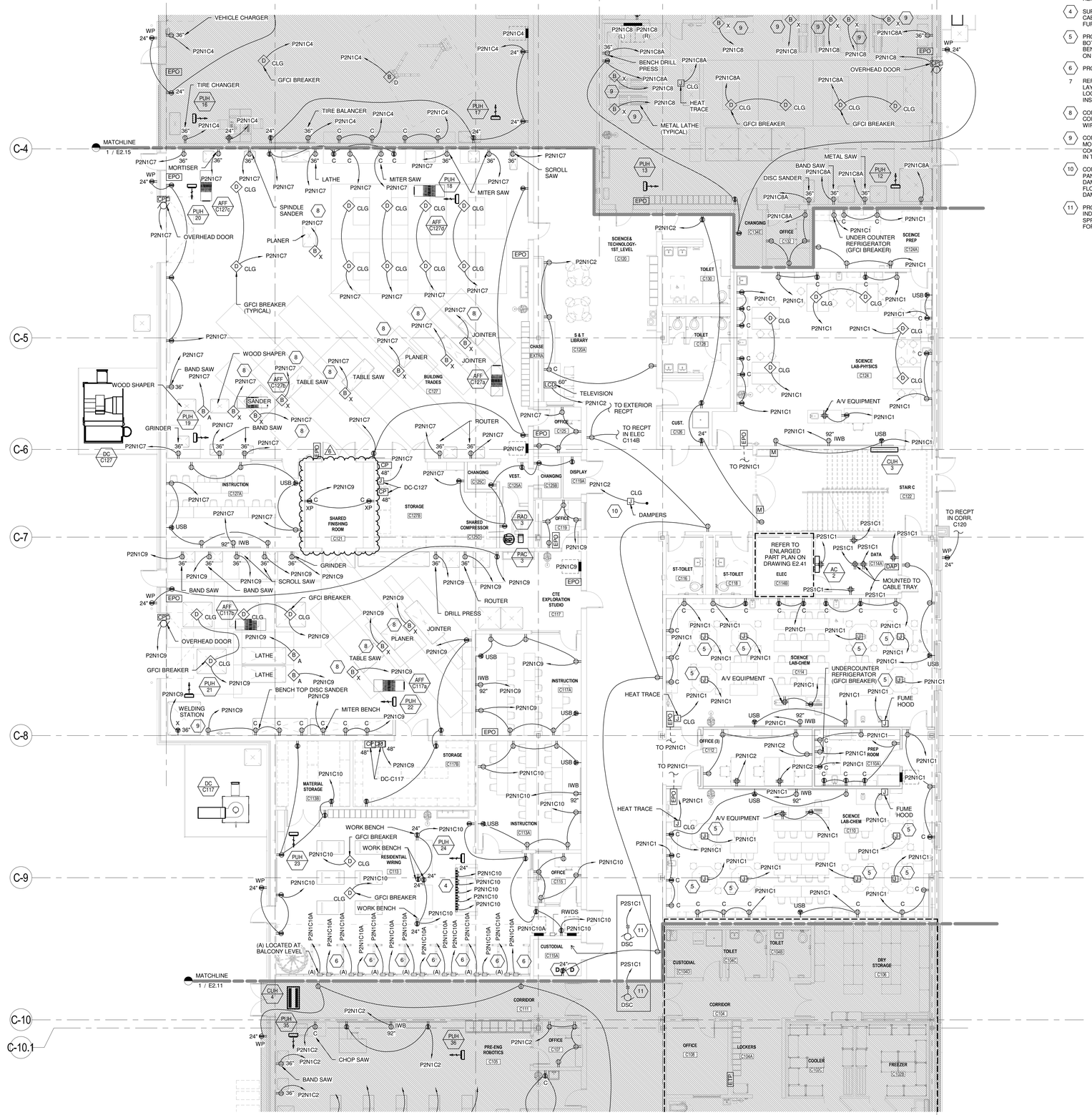

1 LEVEL 1 - POWER PLAN - AREA C1
1/8" = 1'-0"

DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.
3. FOR TYPICAL ELEVATOR/FIRE ALARM CONTROL WIRING DIAGRAM, REFER TO DRAWING FA2.01.
4. SURFACE RACEWAY FOR TOOL CHARGING SHALL BE LOCATED INSIDE CABINET. COORDINATE EXACT MOUNTING REQUIREMENTS WITH THE FURNITURE.
5. PROVIDE CONDUIT STUBBED UP THROUGH THE SLAB INTO THE BOTTOM (INSIDE) THE BENCH TO A JUNCTION BOX. FEED FOUR (4) BENCH-MOUNTED RECEPTACLES (FACTORY INSTALLED ON THE SIDES) ON THE 120V CIRCUIT.
6. PROVIDE 3#10&1#10G-3/4"C FROM DISCONNECT SWITCH TO PANEL.
7. REFER TO DRAWING T3.02 FOR INTERACTIVE WHITE BOARD OUTLET LAYOUT DETAIL. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF INTERACTIVE WHITE BOARDS PRIOR TO THE INSTALLATION OF ANY CABLE OR CONDUIT.
8. CONTRACTOR SHALL PROVIDE BUS DROP CABLE (12-4, W/GRD) WITH CORD CAP, AS REQUIRED, TO POWER MACHINE. COORDINATE EXACT WIRE AND CAP IN THE FIELD WITH THE EQUIPMENT.
9. CONTRACTOR SHALL PROVIDE 4#6&1#10G IN 1" CONDUIT WITH WALL-MOUNTED RECEPTACLE, AS REQUIRED, TO POWER WELDER. COORDINATE EXACT CIRCUIT CONDUCTORS AND RECEPTACLE TYPE IN THE FIELD WITH THE EQUIPMENT.
10. CONTRACTOR SHALL PROVIDE 2#10&1#10G IN ¾" CONDUIT FROM PANEL P2N1C2 TO JUNCTION BOX (120V) FOR CONNECTION OF DAMPERS (IN THIS VICINITY). CONNECT ALL SMOKE DAMPERS IN FIRST FLOOR AREAS A2, C1 AND C2 ON ONE CIRCUIT. FOR LOCATION OF DAMPERS, REFER TO FIRE ALARM DRAWINGS.
11. PROVIDE 20 AMP, 3-POLE CIRCUIT BREAKER (IN PANELBOARD INDICATED) AND 4#10&1#10G-3/4" CONDUIT FROM PANEL TO DRY SPRINKLER COMPRESSOR (DSC). PROVIDE COMBINATION STARTER FOR 1 1/2HP COMPRESSOR MOTOR AT THE UNIT.

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STATE OF MAINE CHRISTOPHER M. SHUMWAY No. 10027 LICENSED PROFESSIONAL ENGINEER

Sanford School Department and State of Maine Department of Education

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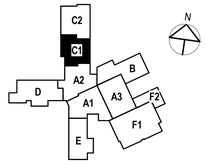
SANFORD, ME 04073

NO.	DESCRIPTION	DATE
5	ADDENDUM #5	2016-03-17
6	ADDENDUM #6	2016-03-23



CONTENT:
FIRST FLOOR POWER PLAN - AREA C1

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/8" = 1'-0"

E2.14

Project Phase
BID DOCUMENTS

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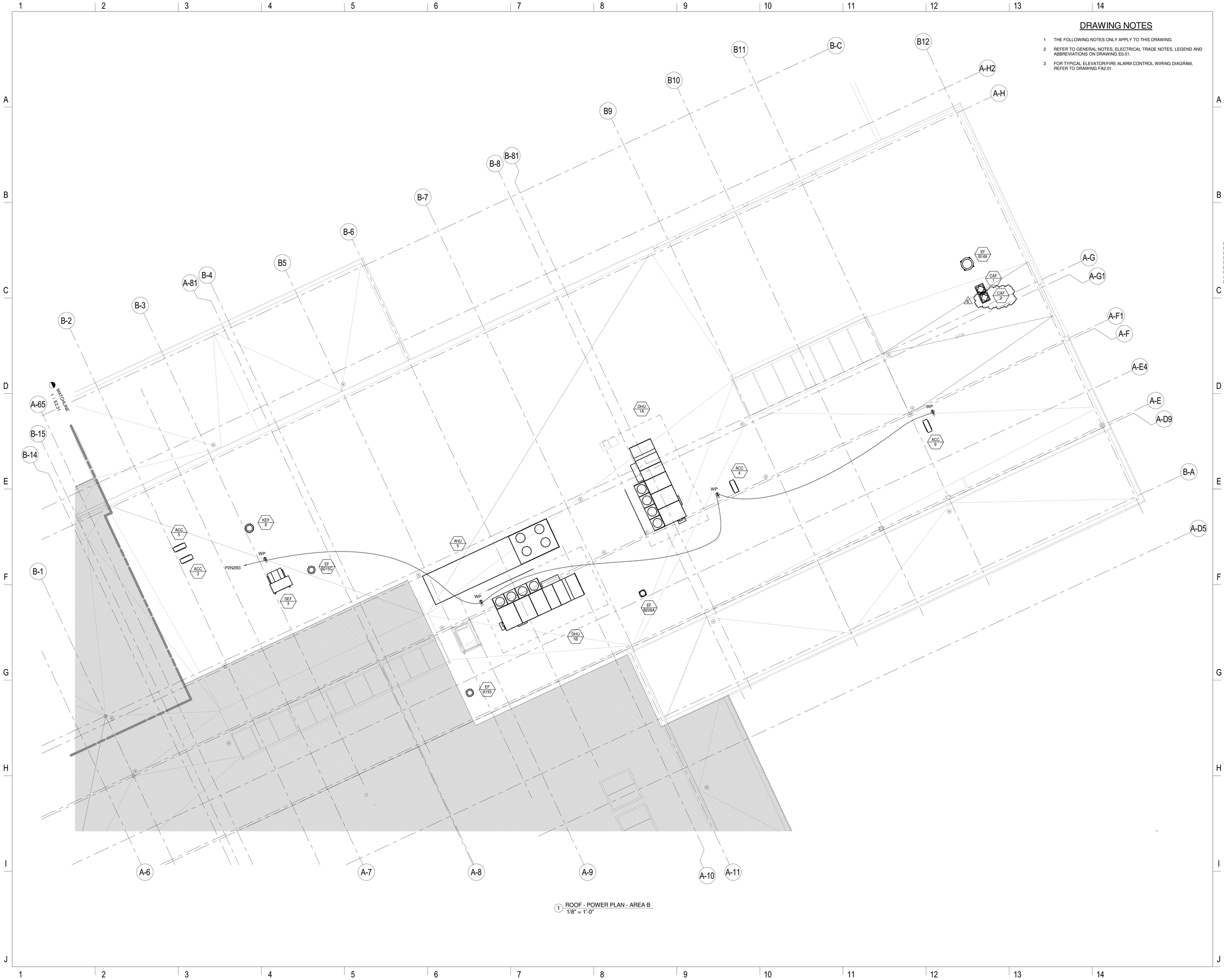
DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.
3. FOR TYPICAL ELEVATOR/FIRE ALARM CONTROL WIRING DIAGRAM, REFER TO DRAWING FA2.01.



1 ROOF - POWER PLAN - AREA B
1/8" = 1'-0"

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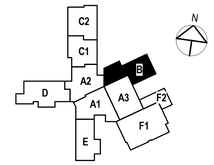
NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23



CONTENT:
ROOF POWER PLAN - AREA B

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/8" = 1'-0"

E2.33

Project Phase
BID DOCUMENTS

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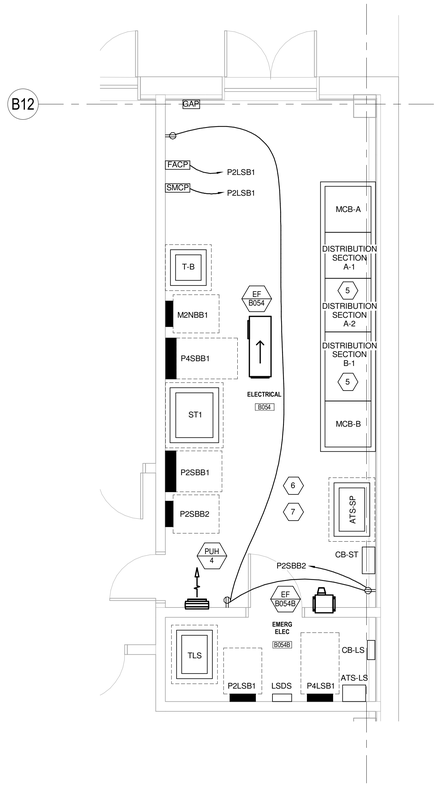
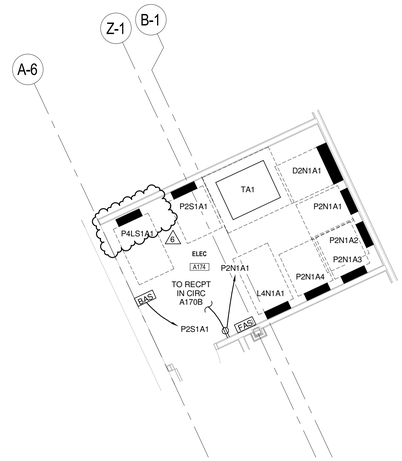
DRAWING NOTES

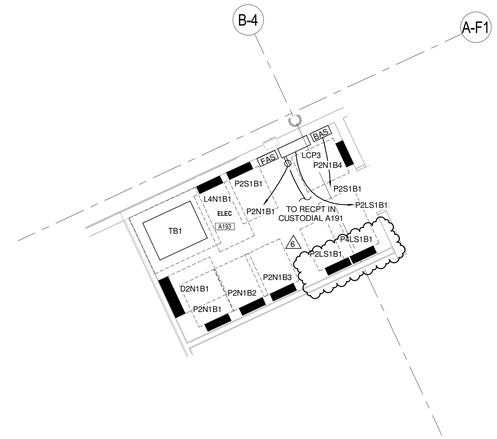
1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.
3. FOR TYPICAL ELEVATOR/FIRE ALARM CONTROL WIRING DIAGRAM, REFER TO DRAWING FA2.01.
4. CONTRACTOR SHALL COORDINATE ALL EQUIPMENT SHOWN IN THESE ELECTRIC ROOMS PRIOR TO THE START OF ANY WORK. ANY EQUIPMENT (INSTALLED PRIOR TO FULL COORDINATION) THAT NEEDS TO BE REWORKED OR RELOCATED SHALL BE DONE AT NO COST TO THE OWNER.
5. CONTRACTOR SHALL PROVIDE TWO (2) 3" SPARE CONDUITS AND THREE (3) 4" SPARE CONDUITS IN THE FLOOR SLAB BELOW EACH OF THE TWO MAIN SWITCHBOARDS (MSB-A, B), AND EXTEND THEM OVER AND UP INSIDE THE CONDUIT WALL CHASE(S) (ADJACENT TO THE STAIRS) TO A POINT IN THE CORRIDOR CEILING ON THE FIRST FLOOR. CONDUITS SHALL BE CAPPED AND TAGGED IDENTIFYING THEM, AND WHERE THEY ORIGINATE. FOR CONDUIT CHASE LOCATION, REFER TO DRAWING E2.13.
6. ALL CONDUITS TO EQUIPMENT IN THESE ROOMS (B054 AND B054B) SHALL ENTER UP THROUGH THE FLOOR SLAB AND INTO THE ENCLOSURES. ALL OUTGOING CONDUITS EXITING THE ROOM TO THE SITE SHALL BE CORED AND HAVE LINK-SEALS TO PREVENT LEAKAGE.
7. ALL FLOOR MOUNTED EQUIPMENT IN THESE ROOMS SHALL BE MOUNTED ON 4" HIGH CONCRETE HOUSEKEEPING PADS (AS INDICATED).



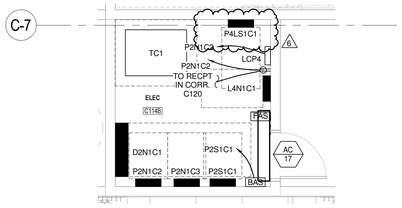
1 BASEMENT - ENLARGED ELECTRICAL B054 POWER PART PLAN - AREA B
1/4" = 1'-0"



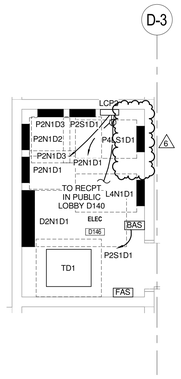
2 LEVEL 1 - ENLARGED ELEC A174 POWER PART PLAN - AREA A3
1/4" = 1'-0"



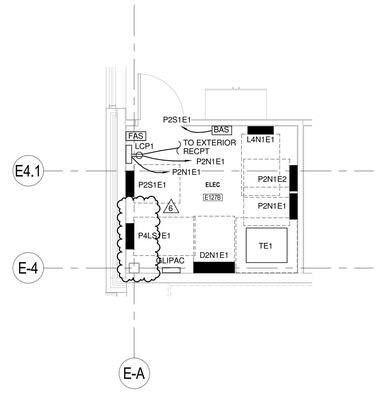
3 LEVEL 1 - ENLARGED ELEC A193 POWER PART PLAN - AREA A3
1/4" = 1'-0"



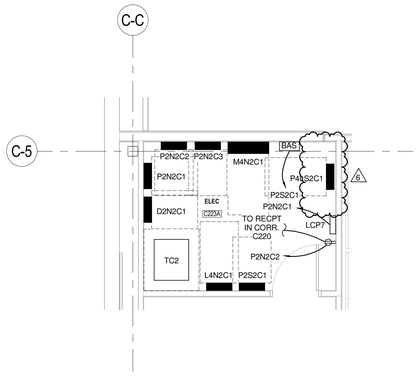
4 LEVEL 1 - ENLARGED ELEC C114B POWER PART PLAN - AREA C1
1/4" = 1'-0"



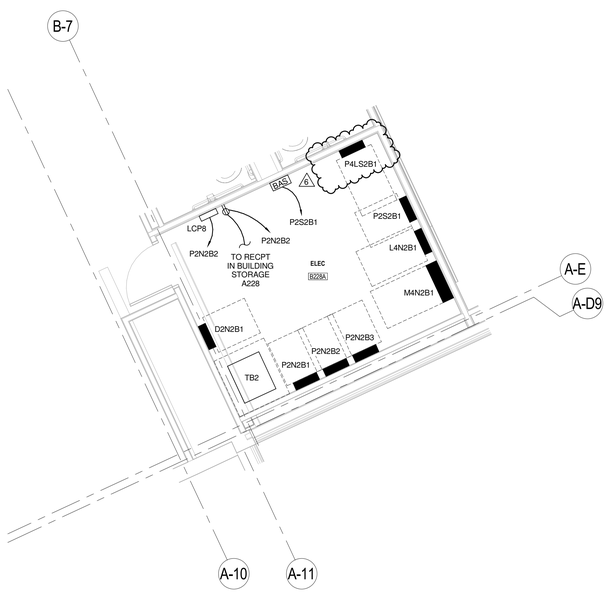
5 LEVEL 1 - ENLARGED ELEC D146 POWER PART PLAN - AREA D
1/4" = 1'-0"



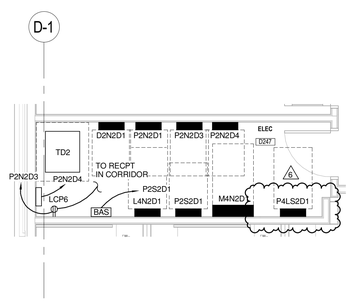
6 LEVEL 1 - ENLARGED ELEC E127B POWER PART PLAN - AREA E
1/4" = 1'-0"



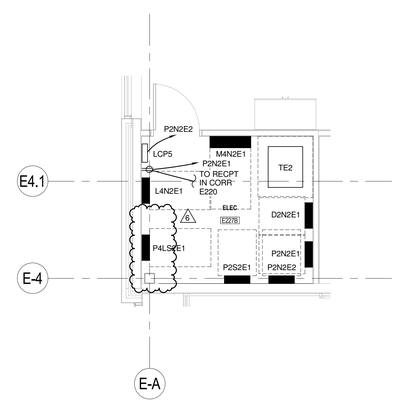
7 LEVEL 2 - ENLARGED ELEC C223A POWER PART PLAN - AREA C1
1/4" = 1'-0"



8 LEVEL 2 - ENLARGED ELEC B228A POWER PART PLAN - AREA B
1/4" = 1'-0"



9 LEVEL 2 - ENLARGED ELEC D247 POWER PART PLAN - AREA D
1/4" = 1'-0"



10 LEVEL 2 - ENLARGED ELEC E227B POWER PART PLAN - AREA E
1/4" = 1'-0"

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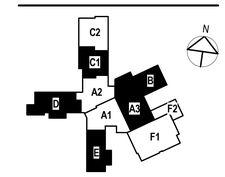
NO.	DESCRIPTION	DATE
3	ADDENDUM #3	2016-03-04
6	ADDENDUM #6	2016-03-23



CONTENT:
ENLARGED POWER PART PLANS

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/4" = 1'-0"

E2.41

Project Phase
BID DOCUMENTS

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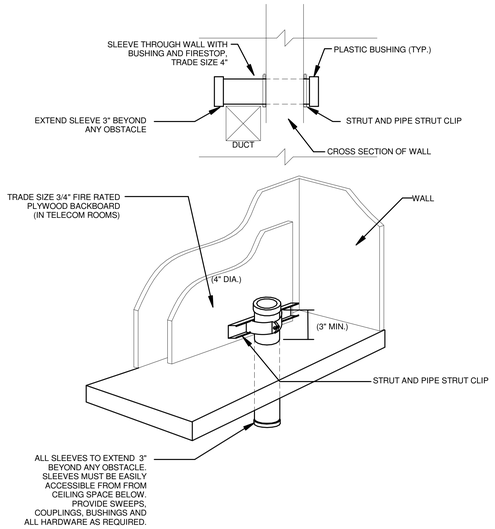
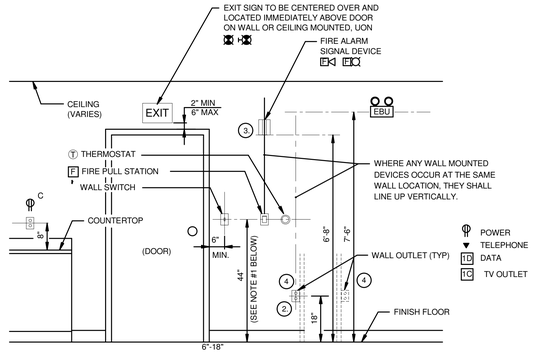
3/24/2016 9:36:37 AM C:\Users\cnm006\Desktop\DRAWINGS\REVIT MEP\7300 (2016 FORMAT)\7300 Central Elect 2016.rvt



1 SLEEVE / CONDUIT DETAILS
NOT TO SCALE



2 TYPICAL DEVICE LOCATIONS
NOT TO SCALE

NOTE:

1 HEIGHT GIVEN FOR THIS DEVICE IS THE MAXIMUM HEIGHT TO THE HIGHEST OPERABLE PART OF THE DEVICE

2 WHERE ELECTRICAL DEVICES ARE LOCATED ON EXTERIOR WALLS ABOVE FINTUBE, MOUNT DEVICES ABOVE FINTUBE. MOUNTING HEIGHT SHALL BE MINIMUM 18" AFF OR 4" ABOVE TOP OF FINTUBE ENCLOSURE. COORDINATE FINTUBE LOCATIONS, SIZE AND MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR.

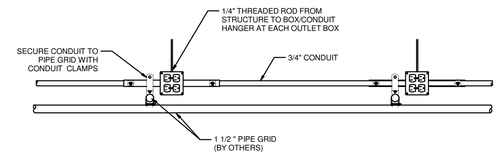
3 MOUNT SIGNAL DEVICE WITH BOTTOM OF LENS AT 80" AFF.

4 WHERE LOCATED ON OPPOSITE SIDES OF COMMON WALLS, DEVICE BOXES SHALL NOT BE INSTALLED BACK-TO-BACK IN THE SAME STUD BAY. WHERE POSSIBLE, ALL BOXES SHALL BE ONE COMPLETE STUD BAY APART.

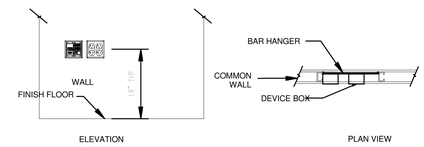
DRAWING NOTES

1 THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.

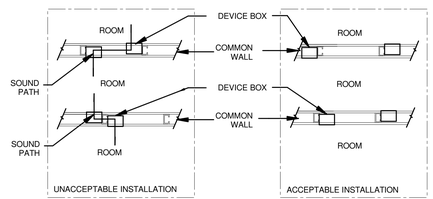
2 REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING E0.01.



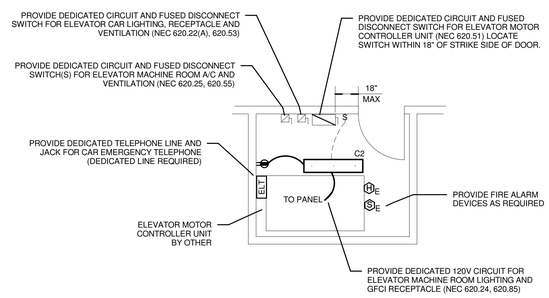
3 GRID MOUNTED OUTLET DETAIL
1/2"=1'-0"



MOUNTING OF ADJACENT ELECTRICAL AND TELECOMMUNICATIONS DEVICE BOXES



6 ACCEPTABLE DEVICE BOX MOUNTING LOCATION
NOT TO SCALE

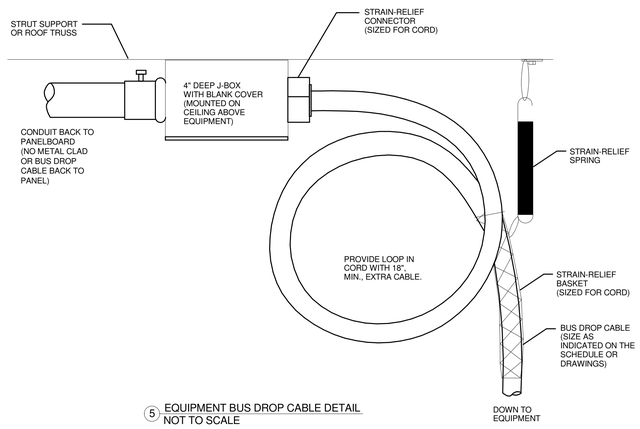


4 TYPICAL ELEVATOR MACHINE ROOM LAYOUT
NOT TO SCALE

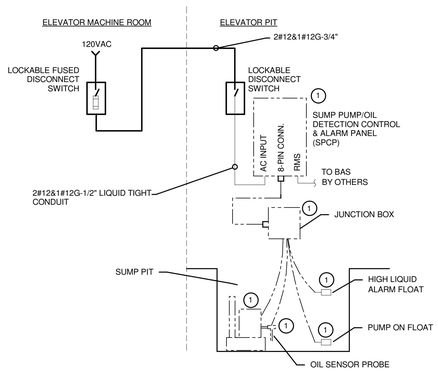
NOTES:

1. THE INSTALLATION OF ELECTRICAL EQUIPMENT AND WIRING ASSOCIATED WITH ELEVATORS, DUMBWAITERS, ESCALATORS, MOVING WALKS, WHEELCHAIR LIFTS AND STAIRWAY LIFTS SHALL CONFORM WITH THE REQUIREMENTS OF THE CURRENT NATIONAL ELECTRIC CODE, ARTICLE 620 AND THE MOST RECENT VERSION OF THE SAFETY CODE FOR ELEVATORS AND ESCALATORS, ANSI/ASME A17.1.

2. THIS DETAIL PROVIDED FOR TYPICAL LAYOUT INFORMATION ONLY. REFER TO ELECTRICAL FLOOR PLANS FOR EXACT SHAPE OF MACHINE ROOM(S) AND FOR EQUIPMENT, DEVICES AND CIRCUITS REQUIRED FOR THIS PROJECT. COORDINATE FINAL LOCATION OF ALL EQUIPMENT WITH ELEVATOR EQUIPMENT VENDOR.



5 EQUIPMENT BUS DROP CABLE DETAIL
NOT TO SCALE



7 SUMP PUMP & OIL DETECTION WIRING DIAGRAM
NOT TO SCALE

NOTES:

1 EQUIPMENT AND PREMANUFACTURED CABLES FURNISHED BY PLUMBING, INSTALLED AND TERMINATED BY ELECTRICAL.

2 COORDINATE THE LOCATION OF EQUIPMENT WITH ELEVATOR CONTRACTOR PRIOR TO THE INSTALLATION OF ANY CONDUIT OR CABLE.

3 ALL WORK SHALL BE IN ACCORDANCE WITH THE NEC

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NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23

FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

CONTENT:
ELECTRICAL DETAILS

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	AS NOTED

E5.01

Project Phase
BID DOCUMENTS

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FIRE ALARM SYSTEM LEGEND

Symbol	Description
FACP	SEMI-RECESSED FIRE ALARM CONTROL PANEL T=TRAINING DEVICE
PACP	SEMI-RECESSED PRE-ACTION CONTROL PANEL
FAS	SEMI-RECESSED FIRE ALARM SUBPANEL
FAA	FIRE ALARM ANNUNCIATOR
VCP	VOICE EVAC CONTROL PANEL AND MICROPHONE
F	FIRE ALARM PULL STATION, MH = 48"AFF, UON T=TRAINING DEVICE
F#	FIRE ALARM STROBE, MH = 6'-8"AFF, UON #=MINIMUM STROBE CANDELA RATING CLG=CEILING MOUNTED T=TRAINING DEVICE
F#	FIRE ALARM SPEAKER STROBE, MH = 6'-8"AFF, UON #=MINIMUM STROBE CANDELA RATING WP=WEATHER PROOF
S x	SMOKE DETECTOR E=ELEVATOR RECALL CONTROL WP=WEATHER PROOF T=TRAINING DEVICE
H x	HEAT DETECTOR, E=ELEVATOR SHUNT CONTROL 135=135°F RATE-OF-RISE/FIXED TEMPERATURE 200=200°F FIXED TEMPERATURE CO=CO DETECTOR INTEGRATED WITH HEAT DETECTOR OR SUPPLY LOCAL STAND ALONE
C x	CARBON MONOXIDE DETECTOR L=LOCAL 120V DETECTOR SB=LOCAL SYSTEM CONNECTED WITH SOUNDER BASE
	FLOW SWITCH *
	TAMPER SWITCH *
PS	PRESSURE SWITCH *
HFP	HOOD FIRE SUPPRESSION SYSTEM *
TS	TEST STATION, MH = 48"AFF, UON
CM	ADDRESSABLE CONTROL MODULE
AM	ADDRESSABLE MODULE
	SPRINKLER ALARM BELL FURNISHED BY SPRINKLER CONTRACTOR, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR
KB	RECESSED LOCKED KEY BOX (KNOX BOX)
M	MAGNETIC DOOR HOLDER **
SMCP	SMOKE CONTROL PANEL
	FIRE/SMOKE DAMPER *
	SMOKE DAMPER *
SD	DUCT MOUNTED SMOKE DETECTOR
F B	FIRE ALARM BEACON, MH = 6'-8"AFF, UON RED = FAA OR FACP LOCATION WHITE = SPRINKLER FLOW INDICATOR BLUE = BUILDING LOCK DOWN INDICATOR
M#	FIRE ALARM SPEAKER STROBE WITH MASS NOTIFICATION STROBE LIGHT, MH = 6'-8"AFF, UON #=MINIMUM STROBE CANDELA RATING
C x	WALL MOUNTED CARBON MONOXIDE DETECTOR L=LOCAL 120V DETECTOR SB=LOCAL SYSTEM CONNECTED WITH SOUNDER BASE
AFD	ACCORDION FIRE DOOR
GD	GAS DETECTOR
W	WET ALARM VALVE - VALVE LOCATION INCLUDES FLOW & TAMPER SWITCH
D	DRY ALARM VALVE - VALVE LOCATION INCLUDES FLOW, TAMPER & PRESSURE SWITCH
F (6)	FIRE ALARM SPEAKER, MH = 6'-8"AFF, UON XP=EXPLOSION PROOF

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT *
C	COUNTER HEIGHT
CLG	CEILING MOUNTED
CUH	CABINET UNIT HEATER *
DN	DOWN
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN *
EHH	ELECTRICAL HANDHOLE
EMH	ELECTRICAL MANHOLE
FB	FAN BOX *
FIBO	FURNISHED AND INSTALLED BY OWNER/OTHERS
HOA	HAND-OFF-AUTO SELECTOR SWITCH
HP	HORSEPOWER
LOR	LOCATED ON ROOF
MC	MECHANICAL CONTRACTOR
MCB	MAIN CIRCUIT BREAKER
MD	MOTORIZED DOOR **
MH	MOUNTING HEIGHT
NTS	NOT TO SCALE
OD	OVERHEAD DOOR **
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PC	PLUMBING CONTRACTOR
PUH	PROPELLER UNIT HEATER *
RF	RETURN FAN *
RTU	ROOF TOP UNIT *
SF	SUPPLY FAN *
SPCP	SEWAGE PUMP CONTROL PANEL
S/S	START/STOP PUSH BUTTONS
S. STL	STAINLESS STEEL
THH	TELECOMMUNICATIONS HANDHOLE
TMH	TELECOMMUNICATIONS MANHOLE
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
VP	VANDAL PROOF
WPCP	WELL PUMP CONTROL PANEL
WG	WIRE GUARD
WP	WEATHER PROOF
WUH	WALL MOUNTED UNIT HEATER *
*	EQUIPMENT PROVIDED BY MECHANICAL TRADE, WIRED BY ELECTRICAL TRADE
**	EQUIPMENT PROVIDED BY DOOR HARDWARE TRADE, WIRED BY ELECTRICAL TRADE

ELECTRICAL TRADE NOTES

1 ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL, STATE AND LOCAL CODES AND THE CURRENT NATIONAL ELECTRICAL CODE (NEC) BY ELECTRICIANS LICENSED BY THE STATE IN WHICH THE WORK IS PERFORMED.

2 THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATION AND ELECTRICAL REQUIREMENTS OF ALL EQUIPMENT PRIOR TO INSTALLING ANY CONDUIT AND/OR CABLE. IF ELECTRICAL REQUIREMENTS DIFFER FROM THOSE INDICATED, OR IF ADDITIONAL EQUIPMENT IS REQUIRED BY CODE, INFORM THE ENGINEER.

3 WIRING FOR ALL SINGLE PHASE CIRCUITS, 20A OR SMALLER, SHALL BE A MINIMUM OF 2#12&1#12G-3/4"C., FOR CIRCUIT LENGTHS UNDER 100FT AND 2#10&1#10G-3/4"C., FOR CIRCUIT LENGTHS 100FT AND OVER , UNLESS OTHERWISE NOTED. CIRCUITS FOR ISOLATED GROUND RECEPTACLES SHALL INCLUDE ADDITIONAL ISOLATED GROUND CONDUCTOR. CIRCUITS FOR DOUBLE SWITCHED LIGHT FIXTURES SHALL INCLUDE ADDITIONAL SWITCHED CONDUCTOR(S) AS REQUIRED. THE SHARING OF NEUTRAL CONDUCTORS IS NOT ALLOWED.

4 MOUNTING HEIGHTS GIVEN FOR ALL WIRING DEVICES (WALL SWITCHES, RECEPTACLES, ETC.), FIRE ALARM DEVICES, TELEPHONE EQUIPMENT, SPEAKERS AND LIGHT FIXTURES ARE TO THE CENTERLINE OF THE JUNCTION BOX USED TO MOUNT THE DEVICE, UNLESS OTHERWISE NOTED.

5 REMOVE AND DISPOSE OF EXISTING ELECTRICAL EQUIPMENT AND ASSOCIATED BOXES, CONDUIT AND WIRE WHERE INDICATED OR WHERE LOCATED ON OR WITHIN WALLS AND CEILINGS BEING DEMOLISHED OR ALTERED AS A RESULT OF THIS CONTRACT, UNLESS OTHERWISE INDICATED. IT IS NOT THE INTENT OF THESE DRAWINGS TO INDICATE ALL ELECTRICAL ITEMS TO BE REMOVED.

6 CIRCUIT WIRING INDICATED ON DRAWINGS IS SCHEMATIC IN NATURE AND SHALL NOT BE CONSIDERED TO BE POINT-TO-POINT, UNLESS OTHERWISE NOTED.

7 EXISTING ELECTRICALLY POWERED ITEMS THAT REMAIN SHALL BE RECIRCUITED, IF NECESSARY, TO ENSURE CONTINUED OPERATION.

8 COORDINATE FINAL LOCATIONS OF CEILING LIGHT FIXTURES AND OTHER EQUIPMENT WITH REFLECTED CEILING PLANS AND ALL OTHER TRADE DRAWINGS PRIOR TO INSTALLATION.

9 WHERE LONG CIRCUIT LENGTHS ARE REQUIRED, ENSURE LESS THAN 3% VOLTAGE DROP UNDER FULL LOAD. INCREASE WIRE SIZE ON CIRCUITS 100 FEET LONG AND ABOVE.

10 PROVIDE AND ENSURE FIREPROOFING OF ALL CONDUIT, CABLING AND ANY OTHER ELECTRICAL DEVICES THROUGH FIRE RATED ASSEMBLIES.

11 PROVIDE PULL STRINGS IN ALL CONDUIT SYSTEMS LEFT FOR USE BY OTHERS.

12 MOUNTING HEIGHT FOR ELECTRICAL DEVICES (RECEPTACLES, MULTICOMMUNICATIONS OUTLETS, ETC) LOCATED ON EXTERIOR WALLS ABOVE FINTUBE SHALL BE 4" FROM TOP OF FINTUBE ENCLOSURE TO CENTERLINE OF ELECTRICAL DEVICE.

13 PROVIDE EXPANSION FITTINGS IN CONDUIT RISERS FROM ALL EXTERIOR UNDERGROUND CONDUITS TO FIXED EQUIPMENT OR CONDUIT FITTINGS AND PROVIDE FLEXIBLE CONNECTIONS TO ANY EQUIPMENT SUBJECT TO SETTLEMENT OR FROST HEAVES.

14 WHERE DOUBLE SWITCHES ARE INDICATED, FIXTURES SHALL BE PROVIDED WITH MULTIPLE BALLASTS.

GENERAL NOTES

THE FOLLOWING GENERAL NOTES APPLY TO ALL RIST-FROST-SHUMWAY ENGINEERING, P.C., DRAWINGS AND TRADES ASSOCIATED WITH THOSE DRAWINGS INVOLVED ON THIS PROJECT:

G-1 RIST-FROST-SHUMWAY ENGINEERING, P.C., WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICA-TIONS AND/OR THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE GUIDANCE OF RIST-FROST-SHUMWAY ENGINEERING, P.C., WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES, AMBIGUITIES OR CONFLICTS WHICH ARE DISCOVERED OR ALLEGED.

G-2 ALL WORK SHALL CONFORM TO ALL FEDERAL, STATE, AND LOCAL CODES AND STANDARDS INCLUDING, BUT NOT LIMITED TO: NFPA, IBC, UL, SMACNA, OSHA, AND NEC.

G-3 THE CONTRACTOR AND ALL SUBCONTRACTORS SHALL PROTECT THE WORK SITE, SURROUNDING AREAS AND OCCUPANTS FROM DAMAGE AND INJURY.

G-4 THE CONTRACTOR AND ALL SUBCONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH THE CONTRACT DOCUMENTS. ALL DRAWINGS OF ANY PARTICULAR TRADE SHALL BE USED IN CONJUNCTION WITH DRAWINGS OF ALL OTHER TRADES TO COORDINATE ALL CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH THE AFFECTED WORK. ANY PROPOSED CHANGES, VARIATIONS OR SUBSTITUTIONS MUST BE REVIEWED AND ACCEPTED BY THE ENGINEER PRIOR TO IMPLEMENTATION.

G-5 ALL DRAWINGS ARE INTENDED TO SHOW THE GENERAL ARRANGE-MENT, DESIGN INTENT AND EXTENT OF THE WORK. THEY SHALL BE CONSIDERED PARTLY DIAGRAMMATIC. THEY ARE NOT INTENDED TO BE SCALED FOR ROUGHING-IN MEASUREMENTS OR TO SERVE AS SHOP DRAWINGS.

G-6 THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMEN-SIONS (AS-BUILT OR OTHERWISE) BEFORE COMMENCING FABRI-CATION, AND/OR ORDERING MATERIALS.

G-7 DETAILS SHOWN ON ANY DRAWING ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITIONS, UNLESS OTHERWISE INDICATED.

G-8 INFORMATION ON THESE DRAWINGS PERTAINING TO AS-BUILT CONSTRUCTION AND OTHER EXISTING CONDITIONS HAVE BEEN OBTAINED FROM OTHER DOCUMENTATION OR BY FIELD INVESTI-GATION. (SEE GENERAL AND SUPPLEMENTAL CONDITIONS FOR LISTING). THIS INFORMATION IS PROVIDED FOR THE CONTRACTOR'S BENEFIT IN PERFORMANCE OF THE WORK.

G-9 IN THE EVENT THE CONTRACTOR ENCOUNTERS MATERIAL REASON-ABLY BELIEVED TO BE HAZARDOUS WHICH HAS NOT BEEN RENDERED HARMLESS, THE CONTRACTOR SHALL IMMEDIATELY STOP WORK IN THE AREA AFFECTED AND REPORT THE CONDITION TO THE OWNER AND ARCHITECT/ENGINEER IN WRITING. THE WORK IN THE AFFECTED AREA SHALL NOT BE RESUMED UNTIL WRITTEN VERIFICATION BY THE OWNER THAT THE MATERIAL HAS BEEN REMOVED OR OTHERWISE BEEN RENDERED HARMLESS.

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Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23

CONTENT:

FIRE ALARM SYMBOLS LEGEND AND TRADE NOTES

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	NO SCALE

FA0.01

Project Phase

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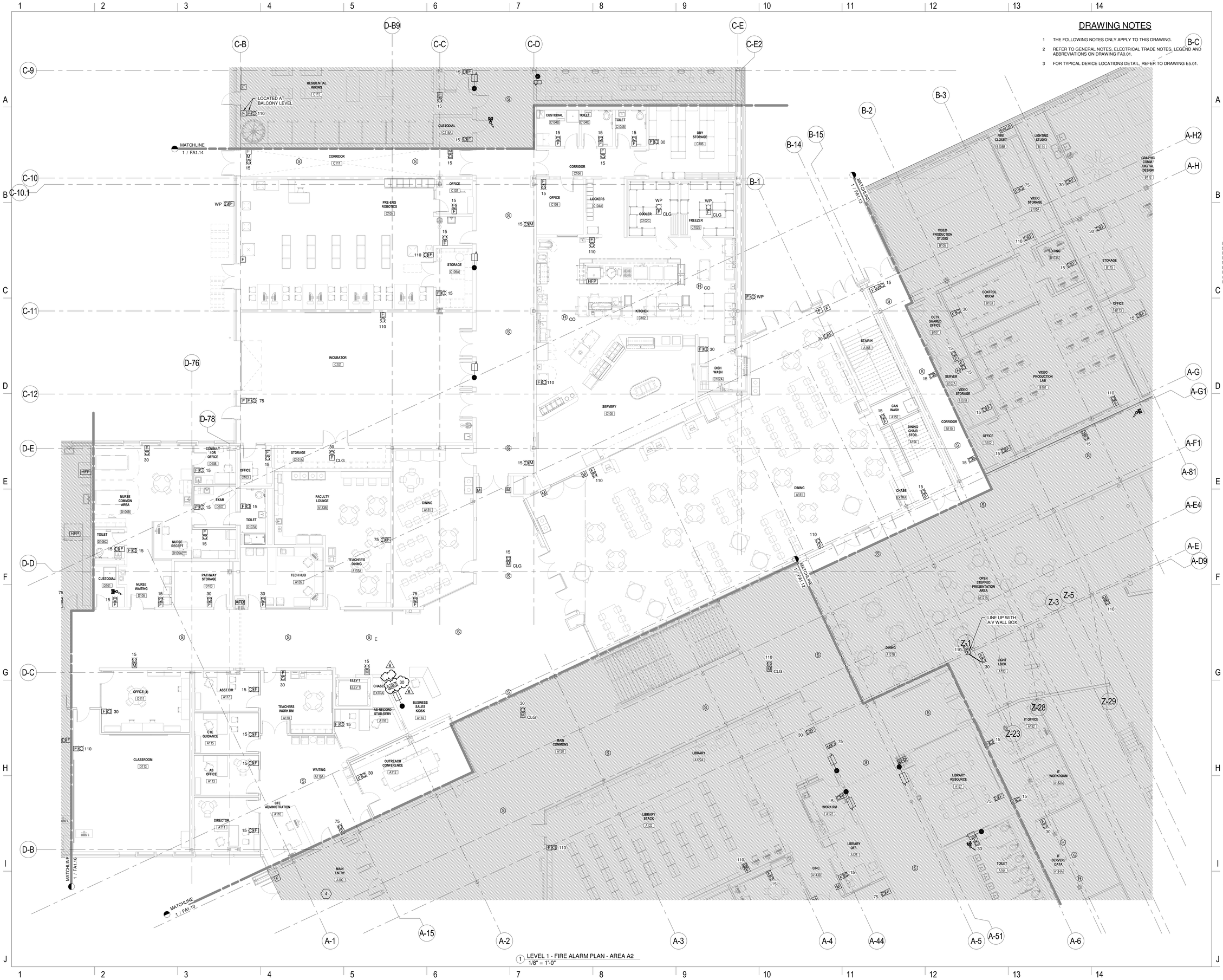
DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING FA0.01.
3. FOR TYPICAL DEVICE LOCATIONS DETAIL, REFER TO DRAWING E5.01.



1 LEVEL 1 - FIRE ALARM PLAN - AREA A2
1/8" = 1'-0"

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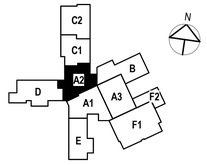
NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23



CONTENT:
FIRST FLOOR FIRE ALARM PLAN - AREA A2

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/8" = 1'-0"

FA1.11

Project Phase
BID DOCUMENTS

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3/24/2016 9:58:57 AM C:\Users\rm690\Desktop\DRAWINGS\REVIT\MEP\300 (2016 FORMAT)\300-Central Elect 2016.rvt

DRAWING NOTES

1. THE FOLLOWING NOTES ONLY APPLY TO THIS DRAWING.
2. REFER TO GENERAL NOTES, ELECTRICAL TRADE NOTES, LEGEND AND ABBREVIATIONS ON DRAWING FA0.01.
3. FOR TYPICAL DEVICE LOCATIONS DETAIL, REFER TO DRAWING E5.01.

1 LEVEL 1 - FIRE ALARM PLAN - AREA C1
1/8" = 1'-0"

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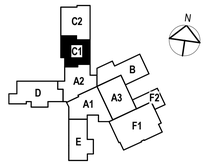
www.rfsengineering.com
RFS Project #: 7300.001

Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23



CONTENT:
FIRST FLOOR FIRE ALARM PLAN - AREA C1

DRAWN BY:	C. NEWELL
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/8" = 1'-0"

FA1.14

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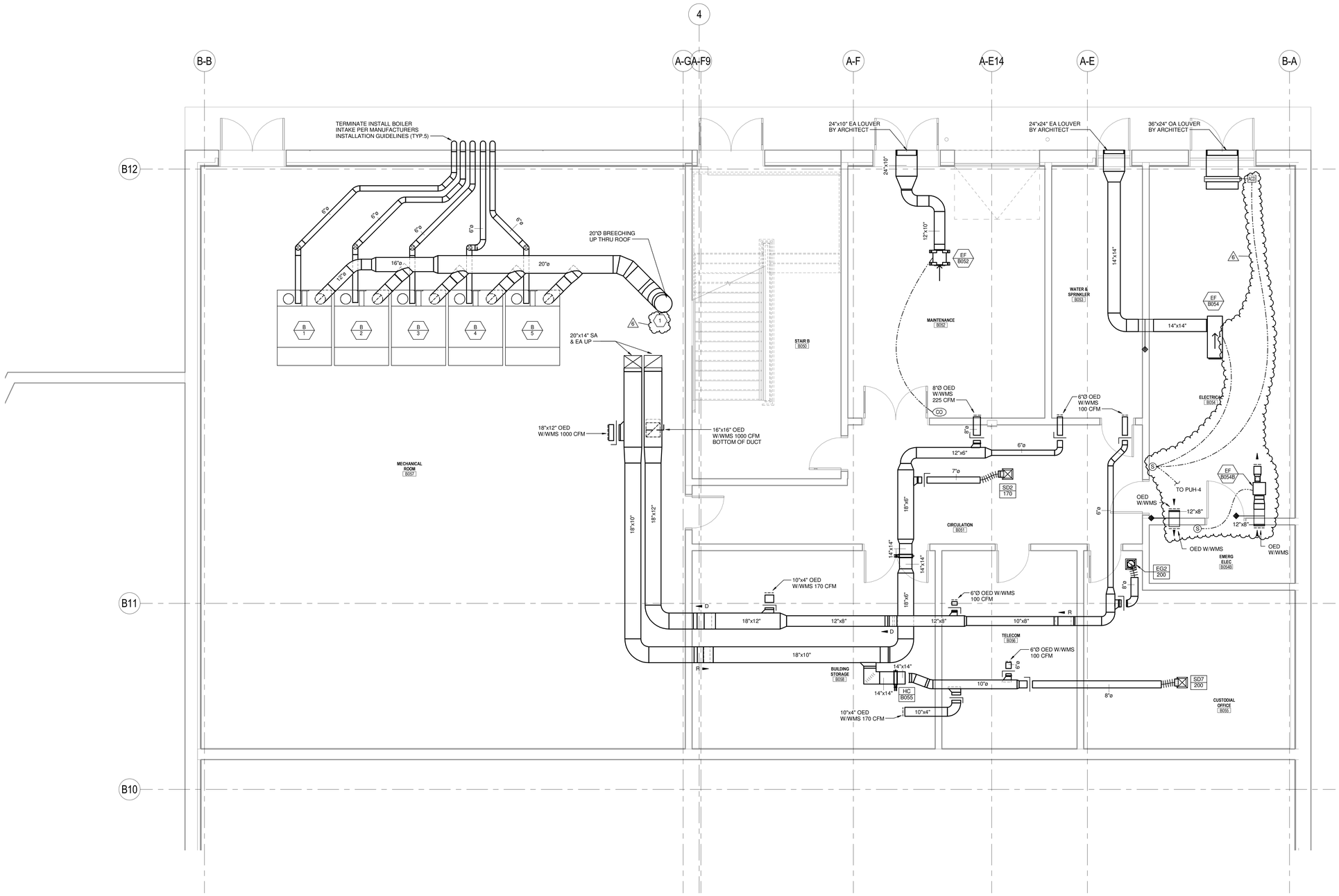
3/24/2016 9:59:10 AM C:\Users\rcm50\Desktop\DRAWINGS\REVIT\ MEP-7300 (2016 FORMAT)-7300 Central Elec 2016.rvt

DRAWING NOTES

1. PROVIDE TRAP AND 1" ACID RESISTANT DRAIN PIPING FROM BREECHING LOW POINT TO NEUTRALIZATION TANK.



1 BASEMENT - DUCTWORK PLAN
1/4" = 1'-0"

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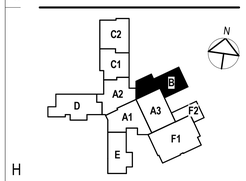
NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23



CONTENT:
BASEMENT - DUCTWORK PLAN

DRAWN BY:	S. DANBY
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/4" = 1'-0"

M1.09

Project Phase
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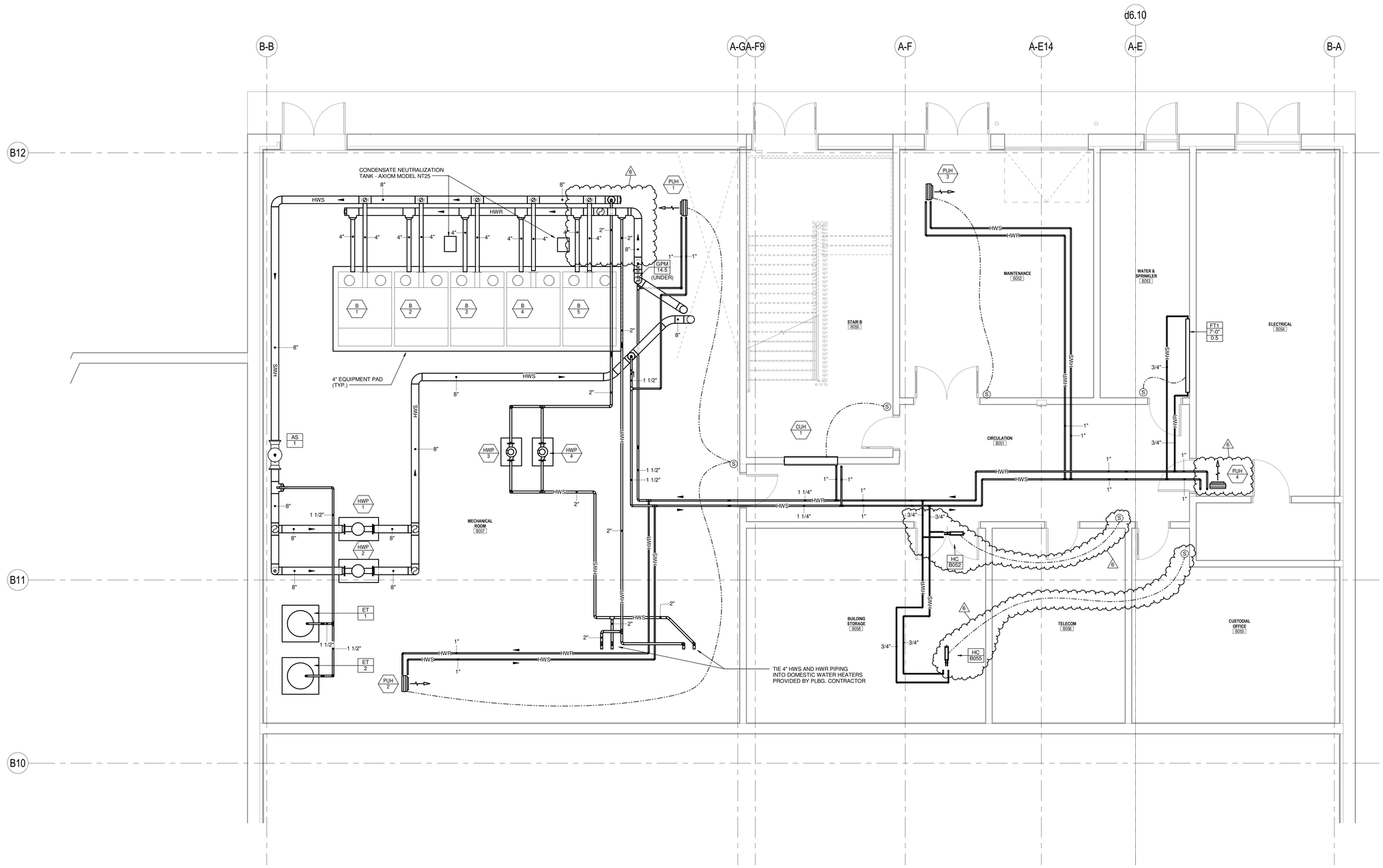
DRAWING NOTES

1. PROVIDE THERMAL EXPANSION COMPENSATION (ANCHORS, GUIDES AND EXPANSION LOOPS WHERE REQUIRED. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.
2. ALL RUN-OUT HEATING HOT WATER PIPING TO MORE THAN 2 HEATING TERMINAL DEVICES SHALL HAVE ISOLATION VALVES ON BOTH SUPPLY AND RETURN AND A BALANCE VALVE ON THE RETURN SIDE.
3. PROVIDE CO2 SENSORS IN ALL SPACES ASSOCIATED WITH MEETING ROOMS, CONFERENCE ROOMS, DINING SPACES, LIBRARY SPACES, ALL GYMS AND AUDITORIUM.
4. REFER TO DUCTWORK DRAWINGS FOR SENSORS AND/ OR THERMOSTATS NOT ASSOCIATED WITH HYDRONIC TERMINAL DEVICES.



1 BASEMENT - PIPING PLAN
1/4" = 1'-0"

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SANFORD HIGH SCHOOL and TECHNICAL CENTER

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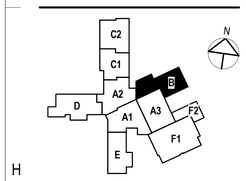
NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23



CONTENT:
BASEMENT PIPING PLAN

DRAWN BY:	D. Elliott
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/4" = 1'-0"

M2.09

Project Phase
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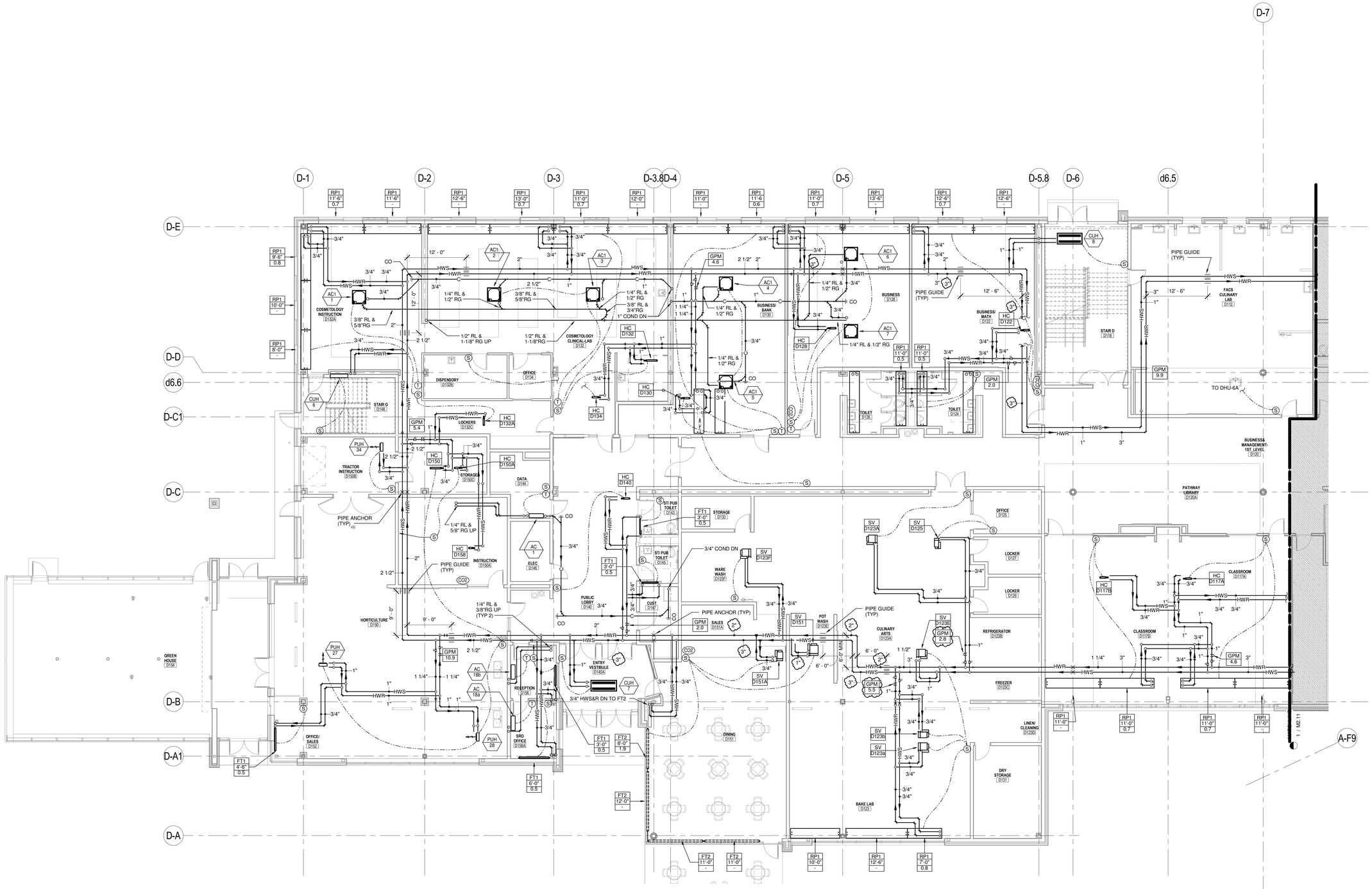
DRAWING NOTES

1. PROVIDE THERMAL EXPANSION COMPENSATION (ANCHORS, GUIDES AND EXPANSION LOOPS WHERE REQUIRED. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.
2. ALL RUN-OUT HEATING HOT WATER PIPING TO MORE THAN 2 HEATING TERMINAL DEVICES SHALL HAVE ISOLATION VALVES ON BOTH SUPPLY AND RETURN AND A BALANCE VALVE ON THE RETURN SIDE.
3. PROVIDE CO2 SENSORS IN ALL SPACES ASSOCIATED WITH MEETING ROOMS, CONFERENCE ROOMS, DINING SPACES, LIBRARY SPACES, ALL GYMS AND AUDITORIUM.
4. REFER TO DUCTWORK DRAWINGS FOR SENSORS AND/ OR THERMOSTATS NOT ASSOCIATED WITH HYDRONIC TERMINAL DEVICES.



1 LEVEL 1 - PIPING PLAN - AREA D
1/8" = 1'-0"

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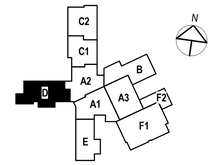
SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23



CONTENT:
FIRST FLOOR - PIPING PLAN - AREA D

DRAWN BY:	D. Elliott
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	1/8" = 1'-0"

M2.16

Project Phase
BID DOCUMENTS

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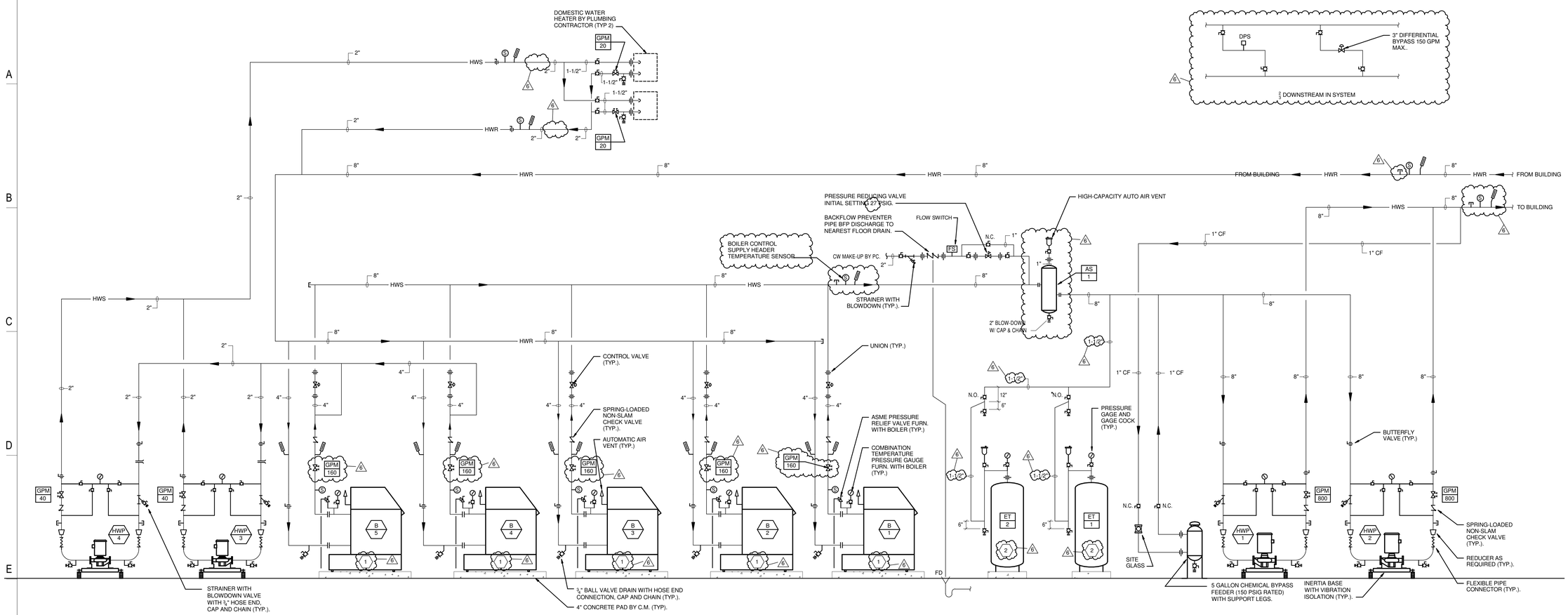
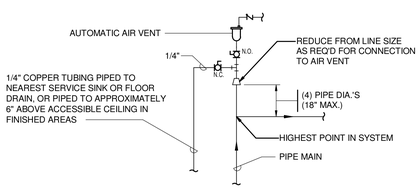


HOT WATER GENERATION SCHEMATIC

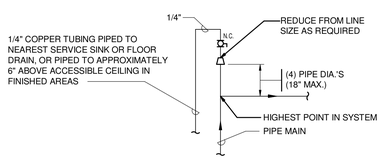
NTS

NOTES:

1. PROVIDE ACID RESISTANT DRAIN PIPING FROM BOILER TO NEUTRALIZATION TANK IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. PRE-CHARGE EXPANSION TANK TO 27 PSIG PRIOR TO FILLING SYSTEM WITH WATER.



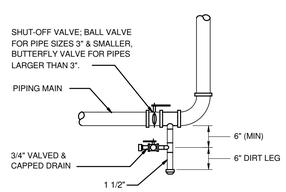
NOTE: 1. DETAIL APPLIES TO ALL PIPING 1 1/2 " AND LARGER.



NOTE: 1. DETAIL APPLIES TO ALL PIPING SMALLER THAN 1 1/2".

WATER SYSTEM HIGH POINT VENT DETAIL

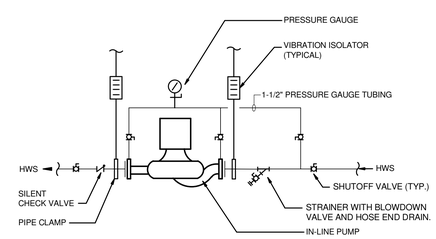
NTS



NOTES:
1. DETAIL APPLIES TO ALL PIPING 2" AND LARGER WHICH RISE MORE THAN 10'-0".
2. SUPPORT HORIZONTAL AND VERTICAL PIPING AS REQUIRED.
3. ANCHOR PIPING AND PROVIDE EXPANSION COMPENSATION AS APPROPRIATE.

PIPE RISER BASE DETAIL

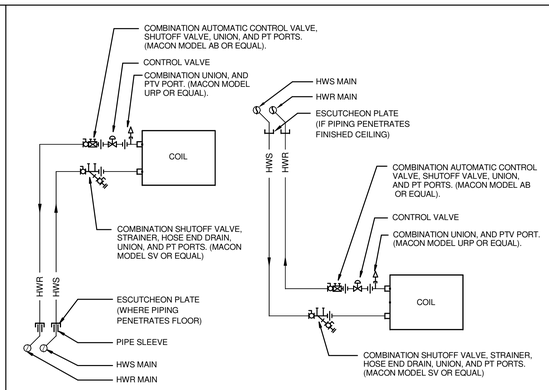
NTS



NOTES: 1. REFER TO "AIR HANDLING UNIT HEATING COIL WITH CIRCULATING PUMP PIPING DETAIL FOR ADDITIONAL INFORMATION". IN THIS CASE, MANUAL BALANCING VALVE IS LOCATED DOWNSTREAM OF COIL RETURN CONN.

IN-LINE CIRCULATING PUMP DETAIL

NTS



UP-FEED PIPING

DOWN-FEED PIPING

NOTE:
1. ROUTE ALL PIPING CONCEALED UNLESS OTHERWISE NOTED ON PLANS.
2. INSTALL PIPE SLEEVES FLUSH WITH FINISH FLOOR AND PROVIDE FIREPROOFING.

CABINET AND PROPELLER UNIT HEATER COIL PIPING DETAIL

NTS

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SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23

FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

CONTENT:	MECHANICAL DETAILS
DRAWN BY:	D. Elliott
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	AS NOTED

M4.01

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MECHANICAL DEHUMIDIFICATION AIR HANDLING UNIT SCHEDULE - DHU

TAG	NUMBER	LOCATION	SERVES	SUPPLY FAN DATA: TOTAL UNIT AIRFLOW (CFM)	MIN. O.A. CFM	TSP (W.C.)	ESP (W.C.)	FAN TYPE	FAN RPM	FAN MOTOR HP	MAX FAN BHP	EXHAUST/RETURN FAN DATA: CFM	TSP (W.C.)	ESP (W.C.)	FAN TYPE	FAN RPM	FAN MOTOR HP	MAX FAN BHP	ENERGY RECOVERY DATA – WINTER CONDITIONS: OA EAT (F) DB/WB	OA LAT (F) DB/WB	EA EAT (F) DB/WB	EA LAT (F) DB/WB	CAPC. MBH TOTAL / SENSIBLE	SUMMER CONDITIONS: OA EAT (F) DB/WB	OA LAT (F) DB/WB	EA EAT (F) DB/WB	EA LAT (F) DB/WB	CAPC. MBH TOTAL / SENSIBLE
DHU	1A	ROOF	B-WING: LEVEL 2 ARTS & COMMUNICATION	8,000	100%	3.6	2.0	PLENUM	2135	10	7.2	8,000	3.2	2.0	PLENUM	2113	10	6.9	-10 / -11	45.5 / 37.5	70.0 / 53.0	14.8 / 14.8	581.5/486.2	81.9 / 72.1	77.1 / 66.3	75 / 62.5	79.8 / 68.8	170.8/42.0
DHU	1B	ROOF	B-WING: LEVEL 1 ARTS & COMMUNICATION	8,000	100%	3.6	2.0	PLENUM	2135	10	7.2	8,000	3.2	2.0	PLENUM	2113	10	6.9	-10 / -11	45.5 / 37.5	70.0 / 53.0	14.8 / 14.8	581.5/486.2	81.9 / 72.1	77.1 / 66.3	75 / 62.5	79.8 / 68.8	170.8/42.0
DHU	2	ROOF	C-WING: LEVEL 2 SCIENCE & TECH	5,000	100%	2.8	2.0	PLENUM	1621	5	3.1	5,000	2.2	1.5	PLENUM	1530	5	2.7	-10 / -11	50.2 / 41.2	70.0 / 53.0	9.8 / 9.8	400.9/333.7	81.9 / 72.1	76.7 / 65.4	75 / 62.5	80.2 / 69.7	121.9 / 28.8
DHU	3	ROOF	C-WING: LEVEL 1 SCIENCE & TECH	13,000	100%	4.2	2.0	PLENUM	2550	20	13.5	13,000	-	2.0	PLENUM	2116	10	7.0	-10 / -11	45.0 / 37.4	70.0 / 53.0	15.0 / 15.0	942.2/770.8	81.9 / 72.1	77.2 / 66.3	75 / 62.5	79.7 / 68.8	276.7/66.4
DHU	4	ROOF	C-WING: SHOPS WELDING & MANUFACTURING	10,000	100%	3.6	2.0	PLENUM	2175	10	8.3	10,000	3.2	2.0	PLENUM	2112	10	7.7	-10 / -11	46.3 / 38.3	70.0 / 53.0	13.7 / 13.7	744.2/619.0	90.0 / 72.0	79.4 / 65.8	75 / 62.5	85.6 / 69.1	221.0/116.1
DHU	5	ROOF	C-WING: SHOPS AUTOMOTIVE & BUILDING TRADES	10,000	100%	3.6	2.0	PLENUM	2175	10	8.3	10,000	3.2	2.0	PLENUM	2112	10	7.7	-10 / -11	46.3 / 38.3	70.0 / 53.0	13.7 / 13.7	744.2/619.0	90.0 / 72.0	79.4 / 65.8	75 / 62.5	85.6 / 69.1	221.0/116.1
DHU	6A	ROOF	FACS CULINARY LAB	5,610	100%	3.0	2.0	PLENUM	1589	5	2.99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DHU	6B	ROOF	D-WING: LEVEL 1 MARKETING & COSMETOLOGY	8,000	100%	3.6	2.0	PLENUM	2135	10	7.2	8,000	3.2	2.0	PLENUM	2113	10	6.9	-10 / -11	45.5 / 37.5	70.0 / 53.0	14.8 / 14.8	581.5/486.2	81.9 / 72.1	77.1 / 66.3	75 / 62.5	79.8 / 68.8	170.8/42.0
DHU	7	ROOF	D-WING: LEVEL 2 SCIENCE & BUSINESS	10,000	100%	3.6	2.0	PLENUM	2175	10	8.3	10,000	3.2	2.0	PLENUM	2112	10	7.7	-10 / -11	46.3 / 38.3	70.0 / 53.0	13.7 / 13.7	744.2/619.0	90.0 / 72.0	79.4 / 65.8	75 / 62.5	85.6 / 69.1	221.0/116.1
DHU	8	ROOF	E-WING: LEVEL 1 & 2 SCIENCE, EMS, FIRE & PATHWAY	13,000	100%	4.2	2.0	PLENUM	2550	20	13.5	13,000	-	2.0	PLENUM	2116	10	7.0	-10 / -11	45.5 / 37.5	70.0 / 53.0	15.0 / 15.0	942.2/770.8	81.9 / 72.1	77.2 / 66.3	75 / 62.5	85.6 / 69.1	276.7/66.4
DHU	9	ROOF	E-WING: LEVEL 1 HEALTH OCC. & CLASSROOMS	10,000	100%	3.6	2.0	PLENUM	2175	10	8.3	10,000	3.2	2.0	PLENUM	2112	10	7.7	-10 / -11	46.3 / 38.3	70.0 / 53.0	13.7 / 13.7	744.2/619.0	90.0 / 72.0	79.4 / 65.8	75 / 62.5	85.6 / 69.1	221.0/116.1
DHU	10	ROOF	F-WING: LOCKER ROOMS	8,000	100%	3.6	2.0	PLENUM	2135	10	7.2	8,000	3.2	2.0	PLENUM	2113	10	6.9	-10 / -11	45.5 / 37.5	70.0 / 53.0	14.8 / 14.8	581.5/486.2	81.9 / 72.1	77.1 / 66.3	75 / 62.5	79.8 / 68.8	170.8/42.0
DHU	11	ROOF	F-WING: FITNESS	6,000	100%	2.3	2.0	PLENUM	1662	5	3.4	6,000	1.9	1.0	PLENUM	1603	5	3.0	-10 / -11	48.6 / 40.0	70.0 / 53.0	11.4 / 11.4	467.2/387.9	81.9 / 72.1	76.8 / 65.6	75 / 62.5	80.1 / 69.4	140.5/33.5
DHU	12	ROOF	A-AREA: LEVEL 1 & 2 LOBBY/CORE	10,000	100%	3.6	2.0	PLENUM	2175	10	8.3	10,000	3.2	2.0	PLENUM	2112	10	7.7	-10 / -11	46.3 / 38.3	70.0 / 53.0	13.7 / 13.7	744.2/619.0	90.0 / 72.0	79.4 / 65.8	75 / 62.5	85.6 / 69.1	221.0/116.1

TAG	NUMBER	DIRECT EXPANSION COIL DATA: EAT DB/WB (F)	LAT DB/WB (F)	TOTAL CAP. MBH	SENS. CAP. MBH	HEATING COIL DATA: EAT (F)	LAT (F)	EWT (F)	LWT (F)	GPM	MBH	HOT GAS REHEAT DATA: EAT DB (F)	LAT DB (F)	LAT WB (F)	MBH	COMPRESSOR DATA: TYPE	# COMP. Qty	CONDENSER FAN DATA: COND. QUANITY	COND. FAN HP (EA.)	FILTERS: TYPE & EFF.	MAX F.V. (FPM)	ELECTRICAL: VOLTS	PHASE	MCA	MFS	FLA	REMARKS
DHU	1A	77.1 / 66.2	50.3 / 50.2	360.0	217.5	NA	NA	NA	NA	NA	NA	45.2	60.53	54.6	88.8	SCROLL	3	4	1	MERV 8	500	460	3	97.2	110	92.5	1 THRU 16, 18, 19 MODEL OAND420A4-D1B400JT-00000AF7JT-G52B0B5C0
DHU	1B	77.1 / 66.2	50.3 / 50.2	360.0	217.5	NA	NA	NA	NA	NA	NA	45.2	60.53	54.6	88.8	SCROLL	3	4	1	MERV 8	500	460	3	97.2	110	92.5	1 THRU 16, 18, 19 MODEL OAND420A4-D1B400JT-00000AF7JT-G52B0B5C0
DHU	2	76.7 / 64.5	43.8 / 43.8	290.5	173.6	NA	NA	NA	NA	NA	NA	50.2	63.1	52.7	104.5	SCROLL	3	4	1	MERV 8	500	460	3	75.2	90	69.5	1 THRU 16, 18, 19 MODEL OAND360A4-D1B400JN-00000AF7JN-G52B005C0
DHU	3	77.2 / 66.3	51.1 / 51.1	556.2	339.8	NA	NA	NA	NA	NA	NA	45.0	64.9	56.8	195.1	SCROLL	3	4	1	MERV 8	500	460	3	142.2	150	136.5	1 THRU 16, 18, 19 MODEL OAND648A4-D1B400LT-00000AF7LN-G82B005C0
DHU	4	79.4 / 65.8	50.7 / 50.7	425.1	295	NA	NA	NA	NA	NA	NA	46.3	59.8	54.7	95.6	SCROLL	3	4	1	MERV 8	500	460	3	111.2	125	105.5	1 THRU 16, 18, 19 MODEL OAND540A4-D1B400LN-00000AF7LN-G71B005C0
DHU	5	79.4 / 65.8	50.7 / 50.7	425.1	295	NA	NA	NA	NA	NA	NA	46.3	59.8	54.7	95.6	SCROLL	3	4	1	MERV 8	500	460	3	111.2	125	105.5	1 THRU 16, 18, 19 MODEL OAND540A4-D1B400LN-00000AF7LN-G71B005C0
DHU	6A	81.2 / 72.1	50.7 / 50.6	375.8	186.7	-10	74	160	130	36.2	544	-	-	-	-	SCROLL	2	4	1	MERV 8	500	460	3	78.6	100	72.2	1 THRU 15, 17, 18, 19 MODEL OAND360A4-D1B400JN-00000AF7JN-G52B005C0
DHU	6B	77.1 / 66.2	50.3 / 50.2	360.0	217.5	NA	NA	NA	NA	NA	NA	45.2	60.5	54.6	88.8	SCROLL	3	4	1	MERV 8	500	460	3	97.2	110	92.5	1 THRU 16, 18, 19 MODEL OAND420A4-D1B400JT-00000AF7JT-G52B0B5C0
DHU	7	79.4 / 65.8	50.7 / 50.7	425.1	295	NA	NA	NA	NA	NA	NA	46.3	59.8	54.7	95.6	SCROLL	3	4	1	MERV 8	500	460	3	111.2	125	105.5	1,THRU 16, 18, 19 MODEL OAND540A4-D1B400LN-00000AF7LN-G71B005C0
DHU	8	77.2 / 66.3	51.1 / 51.1	556.2	339.8	NA	NA	NA	NA	NA	NA	45.0	64.9	56.8	195.1	SCROLL	3	4	1	MERV 8	500	460	3	142.2	150	136.5	1 THRU 16, 18, 19 MODEL OAND648A4-D1B400LT-00000OAFLN-G82B0B5C0
DHU	9	79.4 / 65.8	50.7 / 50.7	425.1	295	NA	NA	NA	NA	NA	NA	46.3	59.8	54.7	95.6	SCROLL	3	4	1	MERV 8	500	460	3	111.2	125	105.5	1 THRU 16, 18, 19 MODEL OAND540A4-D1B400LN-00000AF7LN-G71B005C0
DHU	10	77.1 / 66.2	50.3 / 50.2	360.0	217.5	NA	NA	NA	NA	NA	NA	45.2	60.5	54.6	88.8	SCROLL	3	4	1	MERV 8	500	460	3	97.2	110	92.5	1 THRU 16, 18, 19 MODEL OAND540A4-D1B400LN-00000AF7LN-G71B005C0
DHU	11	76.8 / 65.7	47.7 / 47.7	299.6	181	NA	NA	NA	NA3	NA	NA	46.3	64.6	55.03	109.8	SCROLL	2	4	1	MERV 8	500	460	3	77.5	100	71.1	1 THRU 16, 18, 19 MODEL OAND360A4-D1B400JN-00000AF7JN-G52B005C0
DHU	12	79.4 / 65.8	50.7 / 50.7	425.1	295	NA	NA	NA	NA	NA	NA	46.3	59.8	54.7	95.6	SCROLL	3	4	1	MERV 8	500	460	3	111.2	125	105.5	1 THRU 16, 18, 19 MODEL OAND540A4-D1B400LN-00000AF7LN-G71B005C0

1. SELECTION BASED ON TRANE HORIZON SERIES.
2. WITH SINGLE POINT POWER CONNECTION.
3. WITH UNIT MOUNTED DISCONNECT SWITCH W/115V OUTLET.
4. WITH MODULATING HOT GAS REHEAT.
5. WITH DIGITAL SCROLL PRIMARY CIRCUIT.
6. DISCHARGE AIR CONTROL WITH BACNET INTERFACE AND DISPLAY.
7. WITH SUPPLY FAN, EXHAUST FAN AND ENERGY RECOVERY WHEEL VFD'S.
8. WITH 2" DOUBLE WALL CONSTRUCTION.
9. WITH INTEGRAL DDC CONTROLS AND BACNET INTERFACE.

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10. WITH SUPPLY AND EXHAUST FAN PIEZO RING AIRFLOW MONITORING.
11. WITH STAINLESS STEEL DRIP PAN.
12. WITH CONDENSER HAILGUARD AND LED SERVICE LIGHT.
13. WITH SUPPLY DISCHARGE AIR SENSOR.
14. WITH 5 YEAR COMPRESSOR WARRANTY.
15. WITH SPRING ISOLATED ACOUSTICAL ROOF CURB.
16. WITH ENERGY RECOVERY WHEEL.
17. WITH HOT WATER HEATING COIL.
18. WITH SUPPLY & EXHAUST AIR SMOKE DETECTOR.
19. REFER TO MECHANICAL ROOF PLANS FOR ADDITIONAL INFORMATION.

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MECHANICAL ROOF TOP AIR HANDLING UNIT SCHEDULE - AHU

TAG	NUMBER	LOCATION	SERVES	SUPPLY FAN DATA: TOTAL UNIT AIRFLOW (CFM)	MIN. O.A. CFM	TSP (W.C.)	ESP (W.C.)	FAN TYPE	FAN RPM	FAN HP	FAN BHP	EXHAUST/RETURN FAN DATA: CFM	ESP (W.C.)	FAN TYPE	FAN RPM	FAN HP	FAN BHP	HEATING COIL DATA: EAT DB/WB (F)	LAT DB/WB (F)	EWT (F)	LWT (F)	MBH	GPM	DIRECT EXPANSION COIL DATA: FACE VELOCITY (FPM)	EAT DB/WB (F)	LAT DB/WB (F)	TOTAL CAP. MBH	SENS. CAP. MBH	COMPRESSOR / CONDENSER SECTION: NOMINAL TONS	# COMPRESSOR/TON	COMPRESSOR RLA (PER COMPRESSOR)	CONDENSER FAN QUANTITY	CONDENSER FAN HP (EA.)	CONDENSER FAN FLA	REFRIG. TYPE	HOT GAS REHEAT DATA: EAT DB/WB (F)	LAT DB/WB (F)	LATENT CAPACITY	SENSIBLE CAPACITY	FILTER DATA: TYPE	MAX .F.V. (FPM)	ELECTRICAL DATA: VOLTS	PHASE	MCA	MOCP	EER	IEER	REMARKS
AHU	1	ROOF	A-AREA: AUDITORIUM	15,000		4.1	1.7	FC	1141	25	19.34	14,500	1.4	EXHAUST - FC	754	7.5	6.57	-	85	160	140	732.1	73.3	395	84 / 70	58.7 / 57.9	595.8	423.4	50	1-25 VS / 1-11.5 / 1-10.5	32.6 / 20.2 / 19.1	6	1.0	10.8	R-410A	75 / 67	61 / 53.5	262.21	258.3	MERV 8	400	460	3	128.48	150	10.6	14.3	1 THRU 16, 18, INTELLIPAK MODEL SLHF50
AHU	2	ROOF	A-AREA: STAGE	5,000		3.3	1.7	FC	1215	10	7.63	5,000	1.2	EXHAUST - FC	799	3	2.27		95	160	135	309.25	24.8	246	84 / 70	55.7 /	245.5	155.22	20	2-10.5	19.1	2	1.0	3.6	R-410A	75 / 67	66 / 55	119.41	27.18	MERV 8	400	460	3	64.47	80	10.3	13.6	1 THRU 16, 18, INTELLIPAK MODEL SLHF20
AHU	3	ROOF	F-WING: GYM	12,000		3.8	1.7	FC	1079	20	14.97	11,500	1.4	EXHAUST - FC	756	7.5	5.23		80	160	140	805.4	80.6	316	84 / 70	55.81 / 55.18	572.8	379.3	50	1-25 VS / 1-11.5 / 1-10.5	32.6 / 20.2 / 19.1	6	1.0	10.8	R-410A	75 / 67	61 / 50.5	266.0	208.2	MERV 8	400	460	3	128.48	150	10.6	14.3	1 THRU 16, 18, INTELLIPAK MODEL SLHF50
AHU	4	ROOF	F-WING: PRACTICE GYM	8,000		4.0	1.7	FC	1371	15	12.2	7,500	1.4	EXHAUST - FC	885	5	3.6		82	160	130	431.0	28.8	394	84 / 70	59.1 / 58.2	310.5	220.3	25	1-10 / 1-13.5	22.5 / 19.1	3	1.0	5.4	R-410A	75 / 67	66 / 53.8	137.46	91.4	MERV 8	400	460	3	75.0	90	10.3	13.8	1 THRU 16, 18, INTELLIPAK MODEL SLHF25
AHU	5	ROOF	B-WING: GRAPHIC, VIDEO, SPEC. NEEDS	12,000		3.3	2.5	FC	1010	15	12.72	11,000	1.8	RETURN - FC	1270	7.5	5.8		75	160	130	460.8	30.75	369	80 / 67	55.5 / 54.86	453.1	326.7	40	1-17 VS / 1-9.0 / 1-7.5	26.0 / 15.9 / 13.1	4	1.0	7.2	R-410A	NA	NA	NA	NA	MERV 8	400	460	3	97.72	110	10.4	14.2	1 THRU 18 INTELLIPAK MODEL SLHF40
AHU	6	ROOF	A-AREA: KITCHEN, DINING	9,000	8,200	3.7	1.7	FC	974	15	10.39	4,000	1.0	EXHAUST - FC	640	5.0	2.55		72	160	130	693.0	46.2	277	86 / 72	57.2 / 56.3	469.4	287.6	40	1-17 VS / 1-9.0 / 1-7.5	26.0 / 15.9 / 13.1	4	1.0	7.2	R-410A	75 / 67	66 / 50	166.0	103.8	MERV 8	400	460	3	94.92	110	10.4	14.2	1 THRU 18 INTELLIPAK MODEL SLHF40
AHU	7	ROOF	A-AREA: LEVEL 1 & 2 OFFICES & FACULTY	12,000	3,000	3.4	2.5	FC	1010	15	12.72	11,000	1.8	RETURN - FC	1270	7.5	5.8	-	74	160	125	434.3	25.0	369	80 / 67	55.5 / 54.9	453.1	326.7	40	1-17 VS / 1-9.0 / 1-7.5	26.0 / 15.9 / 13.1	4	1.0	7.2	R-410A	NA	NA	NA	NA	MERV 8	400	460	3	97.72	110	10.4	14.2	1 THRU 18 INTELLIPAK MODEL SLHF40
AHU	8	ROOF	D-WING: CULINARY ARTS	9,000	8,850	3.4	2.5	FC	974	15	10.30	3,000	1.8	EXHAUST - FC	640	5	2.55		72	160	130	693.0	46.2	277	86 / 72	57.4 / 56.3	469.4	287.6	40	1-17 VS / 1-9.0 / 1-7.5	26.0 / 15.9 / 13.1	4	1.0	7.2	R-410A	NA	NA.	NA	NA	MERV 8	400	460	3	94.92	110	10.4	14.2	1 THRU 18 INTELLIPAK MODEL SLHF40
AHU	9	ROOF	A-AREA: LEVEL 1 & 2 LIBRARY & SPECIAL ED	12,000		4.3	2.5	FC	1138	20	17.25	11,500	1.8	RETURN - FC	780	7.5	5.6		60	160	130	460.8	30.8	369	80 / 67	55.5 / 54.84	453.2	326.7	40	1-17 VS / 1-9.0 / 1-7.5	26.0 / 15.9 / 13.1	4	1.0	7.2	R-410A	NA	NA	NA	NA	MERV 8	400	460	3	106.47	125	10.4	14.2	1 THRU 18 INTELLIPAK MODEL SLHF40

1. SELECTION BASED ON TRANE.
2. CUSTOM COLOR SELECTED BY ARCHITECT.
3. DX COIL PRESSURE DROPS ALLOWED FOR IN SUPPLY SIDE TOTAL STATIC PRESSURE DROPS INDICATED.
4. WITH VARIABLE FREQUENCY DRIVES FOR SUPPLY AND EXHAUST/RETURN FANS.
5. WITH STAINLESS STEEL DRAIN PANS.
6. WITH OUTSIDE AIR MONITORING STATION (TRAQ DAMPER).
7. WITH CARBON DIOXIDE BASED DCV AND HOT GAS BYPASS
8. WITH 100% EXHAUST/RETURN FAN W/STATITRAC PRESSURE CONTROLS.

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9. WITH INTEGRAL DDC CONTROLS AND BACNET COMMUNICATIONS INTERFACE MODULE.
10. WITH SINGLE POINT CONNECTION AND FACTORY MOUNTED DISCONNECT.
11. WITH DOUBLE WALL CASING CONSTRUCTION.
12. WITH PREMIUM EFFICIENCY MOTORS.
13. WITH VARIABLE SPEED COMPRESSOR.
14. WITH OPTIONAL SPRING ISOLATED ACOUSTICAL ROOF CURB.
15. WITH MODULATING HOT GAS REHEAT DEHUMIDIFICATION
16. WITH SUPPLY AND EXHAUST/RETURN FAN PIEZO RING AIRFLOW MONITORING .
17. WITH SUPPLY & EXHAUST AIR SMOKE DETECTOR.
18. REFER TO MECHANICAL ROOF PLANS FOR ADDITIONAL INFORMATION.

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MECHANICAL BOILER SCHEDULE - B

TAG	NUMBER	LOCATION	FUEL	INPUT MBH	OUTPUT MBH	FLUE SIZE DIA.	BOILER HP	ELECTRICAL DATA: FLA	VOLT	PH	REMARKS
B	1	MECH ROOM B057	NATURAL GAS	3300	3168	12	94.6	7	208	3	1 THRU 5, CLEARFIRE MODEL CFC 3300
B	2	MECH ROOM B057	NATURAL GAS	3300	3168	12	94.6	7	208	3	1 THRU 5, CLEARFIRE MODEL CFC 3300
B	3	MECH ROOM B057	NATURAL GAS	3300	3168	12	94.6	7	208	3	1 THRU 5, CLEARFIRE MODEL CFC 3300
B	4	MECH ROOM B057	NATURAL GAS	3300	3168	12	94.6	7	208	3	1 THRU 5, CLEARFIRE MODEL CFC 3300
B	5	MECH ROOM B057	NATURAL GAS	3300	3168	12	94.6	7	208	3	1 THRU 5, CLEARFIRE MODEL CFC 3300

1. SELECTION BASED ON CLEAVER BROOKS.
2. WITH 4" BOILER ISOLATION VALVE.
3. WITH 12" BOILER ISOLATION VENT DAMPER
4. WITH FALCON CONTROLS AND BACNET INTERFACE.
5. WITH CONDENSATE NEUTRALIZATION TANK (2 REQUIRED) AND ASSOCIATED PIPING.

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MECHANICAL PUMP SCHEDULE - CP, HWP

TAG	NUMBER	SERVES	LOCATION	TYPE	GPM	TOTAL HEAD (W.C.)	MOTOR DATA: HP	VOLT	PH	RPM	REMARKS
CP	1	AHU-1	MAIN GYM (ADJACENT)	IN-LINE	73	17	3/4	460	3	1760	TACO MODEL KV1506
CP	2	AHU-2	MAIN GYM (ADJACENT)	IN-LINE	25	17	1/3	115	1	1760	TACO MODEL 1911
CP	3	AHU-3	PRACTICE GYM (ADJ)	IN-LINE	81	17	3/4	460	3	1760	TACO MODEL KV1506
CP	4	AHU-4	FITNESS	IN-LINE	29	17	1/3	115	1	1760	TACO MODEL 1911
CP	5	AHU-5	ARTS & COMM B220	IN-LINE	31	17	1/3	115	1	1760	TACO MODEL 1911
CP	6	AHU-6	MAIN COMMON A220	IN-LINE	46.2	17	1/2	115	1	1760	TACO MODEL KV1506
CP	7	AHU-7	CAREER DESK A214	IN-LINE	25	17	1/3	115	1	1760	TACO MODEL 1911
CP	8	AHU-8	EARTH SCIENCE D237	IN-LINE	46.2	17	1/2	115	1	1760	TACO MODEL KV1506
CP	9	AHU-9	LEARNING CENTER A224	IN-LINE	31	17	1/3	115	1	1760	TACO MODEL 1911
CP	D6	DHU-6A	PRINT-LAB D210	IN-LINE	36	17	1/2	115	1	1760	TACO MODEL KV1506
HWP	1	HEATING HOT WATER	MECH ROOM B057	IN-LINE	800	90	25	460	3	1760	TACO MODEL 6011 WITH VFD CONTROL
HWP	2	HEATING HOT WATER	MECH ROOM B057	IN-LINE	800	90	25	460	3	1760	TACO MODEL 6011 WITH VFD CONTROL
HWP	3	HEATING HOT WATER	MECH ROOM B057	IN-LINE	40	17	3/4	460	3	1760	TACO MODEL KV1506
HWP	4	HEATING HOT WATER	MECH ROOM B057	IN-LINE	40	17	3/4	460	3	1760	TACO MODEL KV1506

1. SELECTION BASED ON TACO.

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MECHANICAL EXPANSION TANK SCHEDULE - ET

TAG	NUMBER	LOCATION	SERVES	EXPANSION TANK: TYPE	VOL (TANK/ACCEPT)	APPROX. DIMENSIONS	AIR SEPERATOR: TYPE	APPROX. DIMENSIONS	CAPACITY GPM	REMARKS
ET	1	BOILER ROOM	HEATING HOT WATER	BLADDER	211	30"Ø x 92"H	COALESCENT MEDIA	16"Ø x 52"H	940	1, MODEL CA-800; AS-1 SPIROVENT MODEL VDT800
ET	2	BOILER ROOM	HEATING HOT WATER	BLADDER	211	30"Ø x 92"H	COALESCENT MEDIA	16"Ø x 52"H	940	1, MODEL CA-800; AS-1 SPIROVENT MODEL VDT800

1. EXPANSION TANK SELECTION BASED ON TACO.

MECHANICAL COMBUSTION AIR FAN SCHEDULE - CAF

TAG	NUMBER	SERVES	LOCATION	CFM	SP IN WC	FAN TYPE	DRIVE TYPE	FAN RPM	ELECTRICAL DATA: HP	VOLT	PH	REMARKS
CAF	1	BOILERS	BOILER ROOM	2200	0.111	INLINE CENT.	DIRECT	1720	1.0	460	3	1, 2, 3, MODEL RSV-400
CAF	2	BOILERS	BOILER ROOM	2200	0.111	INLINE CENT.	DIRECT	1720	1.0	460	3	1, 2, 3, MODEL RSV-400

1. SELECTION BASED ON ENERVEX.
2. PROVIDE CUSTOM PLENUM TRANSITION TO BREACHING AS RECOMMENDED BY MANUFACTURER.
3. PROVIDE VFD, MOTOR DISCONNECT, AND MODULATING DRAFT CONTROL PROBE.

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MECHANICAL SOUND ATTENUATOR SCHEDULE - SA

TAG	NUMBER	SERVES	CFM	PD IN WG	ATTENUATOR SIZE WxHxL INxINxIN	NOISE ATTENUATION IN DB (DIL) – OCTAVE BAND: 1	2	3	4	5	7	6	8	REMARKS
SA	1Ra	AHU-1 RETURN	7500	0.01	60x40x60	6	8	15	22	16	11	9	8	1, 2, 3, 4 Model RH60/9B
SA	1Rb	AHU-1 RETURN	7500	0.01	60x40x60	6	8	15	22	16	11	9	8	1, 2, 3, 4 Model RH60/9B
SA	2R	AHU-1 RETURN	5000	0.02	36x26x60	7	9	14	19	14	11	9	7	1, 2, 3, 4 Model RH60/WB
SA	1S	AHU-1 SUPPLY	15000	0.01	60 Dia. x 72	3	5	11	7	5	4	4	3	1, 2, 3, 4 Model CH72/60A
SA	2S	AHU-2 SUPPLY	5000	0.03	36x26x60	7	9	14	20	14	12	10	8	1, 2, 3, 4 Model RH60/WC
SA	3Ra	AHU-3 RETURN	6000	0.05	40x20x60	7	9	14	17	13	11	9	8	1, 2, 3, 4 Model RH60/XB
SA	3Rb	AHU-3 RETURN	6000	0.05	40x20x60	7	9	14	17	13	11	9	8	1, 2, 3, 4 Model RH60/XB
SA	3S	AHU-3 SUPPLY	12000	0.02	48 Dia. x 60	3	4	12	20	17	10	8	7	1, 2, 3, 4 Model CM60/48B
SA	4R	AHU-4 RETURN	8000	0.02	60x20x60	5	7	13	19	13	10	8	7	1, 2, 3, 4 Model RH60/9A
SA	4S	AHU-4 SUPPLY	8000	0.01	36 Dia. x 60	3	4	12	18	13	8	7	7	1, 2, 3, 4 Model CH60/36A
SA	5Ra	AHU-5 RETURN	7500	0.04	36x26x60	6	8	13	16	13	10	8	6	1, 2, 3, 4 Model RH60/WA
SA	5Rb	AHU-5 RETURN	4500	0.04	34x18x60	6	9	14	20	14	11	9	8	1, 2, 3, 4 Model RH60/VB
SA	5S	AHU-5 SUPPLY	12000	0.05	34x18x60	6	8	14	23	18	13	10	9	1, 2, 3, 4 Model RH60/7B
SA	6R	AHU-6 RETURN	3000	0.01	36x18x60	6	8	13	16	12	10	8	6	1, 2, 3, 4 Model RH60/WA
SA	6S	AHU-6 SUPPLY	9000	0.02	50x30x60	5	7	12	20	14	11	9	7	1, 2, 3, 4 Model RH60/7A
SA	7R	AHU-7 RETURN	11000	0.03	50x30x60	5	7	12	21	15	11	9	7	1, 2, 3, 4 Model RH60/7A
SA	7S	AHU-7 SUPPLY	12000	0.04	50x30x60	5	7	12	20	14	11	9	7	1, 2, 3, 4 Model RH60/7A
SA	8R	AHU-8 RETURN	3000	0.02	28x20x60	5	7	13	20	14	10	8	7	1, 2, 3, 4 Model RH60/8A
SA	8S	AHU-8 SUPPLY	9000	0.08	42x24x60	7	8	13	17	13	11	9	8	1, 2, 3, 4 Model RH60/XB
SA	9Ra	AHU-9 RETURN	7500	0.04	36x26x60	6	8	13	16	13	10	8	6	1, 2, 3, 4 Model RH60/WA
SA	9Rb	AHU-9 RETURN	4000	0.02	34x20x60	6	7	13	17	12	10	8	7	1, 2, 3, 4 Model RH60/VA
SA	9S	AHU-9 SUPPLY	12000	0.05	50x30x60	6	8	14	23	18	13	10	9	1, 2, 3, 4 Model RH60/7B
SA	1AEa	DHU-1A EXHAUST	4620	0.05	26x20x60	5	7	12	21	15	11	9	7	1, 2, 3, 4 Model RH60/7A
SA	1AEb	DHU-1A EXHAUST	2700	0.05	24x16x36	6	8	9	12	11	9	8	6	1, 2, 3, 4 Model RH60/ZB
SA	1AS	DHU-1A SUPPLY	8000	0.07	46x22x60	7	8	13	15	12	11	9	8	1, 2, 3, 4 Model RH60/YB
SA	1BE	DHU-1B EXHAUST	8000	0.03	32x32x60	6	7	13	18	13	10	8	7	1, 2, 3, 4 Model RH60/UA
SA	1BS	DHU-1B SUPPLY	8000	0.03	36x30x60	6	7	13	16	12	10	8	6	1, 2, 3, 4 Model RH60/WA
SA	2E	DHU-2 EXHAUST	5000	0.04	34x18x60	6	7	13	17	13	10	8	7	1, 2, 3, 4 Model RH60/VA
SA	2S	DHU-2 SUPPLY	5000	0.04	34x18x60	6	7	12	17	12	10	8	7	1, 2, 3, 4 Model RH60/VA
SA	3E	DHU-3 EXHAUST	13000	0.05	40x40x60	6	7	13	15	12	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	3S	DHU-3 SUPPLY	13000	0.05	40x40x60	6	7	12	14	11	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	4E	DHU-4 EXHAUST	10000	0.03	60x22x60	5	7	13	19	13	10	8	7	1, 2, 3, 4 Model RH60/9A
SA	4S	DHU-4 SUPPLY	10000	0.03	60x22x60	5	7	12	19	12	10	8	7	1, 2, 3, 4 Model RH60/9A
SA	4S	DHU-4 SUPPLY	10000	0.03	60x22x60	5	7	12	19	12	10	8	7	1, 2, 3, 4 Model RH60/9A
SA	5E	DHU-5 EXHAUST	10000	0.03	60x22x60	5	7	13	19	13	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	5S	DHU-5 SUPPLY	10000	0.04	40x32x60	6	7	12	14	11	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	6AE	DHU-6A EXHAUST	2000	0.02	24x18x60	7	7	13	12	10	9	7	7	1, 2, 3, 4 Model RH60/ZA
SA	6AS	DHU-6A SUPPLY	6000	0.04	40x20x60	6	7	12	14	11	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	6BE	DHU-6B EXHAUST	8000	0.05	42x24x60	6	7	13	15	12	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	6BS	DHU-6B SUPPLY	8000	0.04	40x26x60	6	7	12	14	11	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	7E	DHU-7 EXHAUST	10000	0.03	60x20x60	5	7	13	19	13	10	8	7	1, 2, 3, 4 Model RH60/9A
SA	7S	DHU-7 SUPPLY	10000	0.02	60x24x60	5	7	12	19	12	10	8	7	1, 2, 3, 4 Model RH60/9A
SA	8Ea	DHU-8 EXHAUST	4500	0.03	34x20x60	5	7	9	14	12	9	7	6	1, 2, 3, 4 Model RH36/VA
SA	8Eb	DHU-8 EXHAUST	8750	0.07	44x22x60	7	7	13	13	11	10	8	6	1, 2, 3, 4 Model RH60/YA
SA	8S	DHU-8 SUPPLY	13000	0.03	60x28x60	5	7	12	19	12	10	8	7	1, 2, 3, 4 Model RH60/9A
SA	9Ea	DHU-9 EXHAUST	5300	0.01	28 Dia. x 60	3	5	14	24	18	10	10	10	1, 2, 3, 4 Model RH36/VA
SA	9Eb	DHU-9 EXHAUST	8750	0.03	44x22x60	5	6	8	12	11	9	7	5	1, 2, 3, 4 Model RH60/YA
SA	9Sa	DHU-9 SUPPLY	6500	0.02	30 Dia. x 60	3	5	13	23	18	10	10	10	1, 2, 3, 4 Model CH60/30A
SA	9Sb	DHU-9 SUPPLY	1500	0.01	20 Dia. x 60	4	7	19	36	33	20	15	16	1, 2, 3, 4 Model CH60/20A
SA	9Sc	DHU-9 SUPPLY	2000	0.03	22x16x36	6	7	9	13	11	10	8	7	1, 2, 3, 4 Model RH36/YB
SA	10E	DHU-10 EXHAUST	8000	0.05	40x24x60	6	7	13	15	12	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	10S	DHU-10 SUPPLY	8000	0.05	40x24x60	6	7	12	14	11	10	8	7	1, 2, 3, 4 Model RH60/XA
SA	11E	DHU-11 EXHAUST	6000	0.05	44x18x60	7	7	13	13	11	10	8	6	1, 2, 3, 4 Model RH60/YA
SA	11S	DHU-11 SUPPLY	6000	0.05	44x18x60	6	7	12	13	11	10	8	7	1, 2, 3, 4 Model RH60/YA
SA	12E	DHU-12 EXHAUST	10000	0.03	60x22x60	5	7	12	19	12	10	8	7	1, 2, 3, 4 Model RH60/8A
SA	12S	DHU-12 SUPPLY	10000	0.04	56x22x60	5	7	12	20	13	10	8	7	1, 2, 3, 4 Model RH60/9A

1. SELECTION BASED ON PRICE.
2. PROVIDE WITH 1.5" FLANGE ATTACHED ON INLET AND OUTLET.
3. PROVIDE WITH MATIC FILLED SEAMS.
4. SHIP WITH PLASTIC COVERED ENDS.

LAVALLEE BRENSINGER ARCHITECTS
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STATE OF MAINE CHRISTOPHER M. SHUMWAY No. 10820 LICENSED PROFESSIONAL ENGINEER

Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23

CONTENT:
MECHANICAL SCHEDULES

DRAWN BY: S. DANBY
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE: NO SCALE

M5.01

Project Phase
BID DOCUMENTS

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FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

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MECHANICAL CABINET UNIT HEATER SCHEDULE - CUH

TAG	NUMBER	LOCATION	AIR SIDE CFM	AIR SIDE EAT (F)	AIR SIDE MBH	WATER SIDE GPM	WATER SIDE MAX PD (FT WC)	WATER SIDE EWT (F)	WATER SIDE LWT (F)	ELECTRICAL COIL DATA HEAT COIL KW	ELECTRICAL COIL DATA AMPS	ELECTRICAL COIL DATA VOLT	ELECTRICAL COIL DATA PH	MOTOR DATA WATTS	MOTOR DATA VOLT	MOTOR DATA PH	REMARKS
CUH	1	STAIR B050	845	60	53.2	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1@1/10;1@1/15	115	1	1, 2, 3, 4, 5, MODEL RW-1120-08
CUH	2	SCIENCE & TECH C120	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	3	STAIR C122	630	60	49.7	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RW-1120-06
CUH	4	CORRIDOR C111	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	5	STAIR 0137	845	60	53.2	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1@1/10;1@1/15	115	1	1, 2, 3, 4, 5, MODEL RW-1120-08
CUH	6	STAIR D148	335	60	22.5	1.8	1.0	160	130	N/A	N/A	N/A	N/A	1/15	115	1	1, 2, 3, 4, 5, MODEL RW-1120-03
CUH	7	ENTRY VESTIBULE D140A	845	60	53.2	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1@1/10;1@1/15	115	1	1, 2, 3, 4, 5, MODEL RC-1120-08
CUH	8	STAIR D118	630	60	49.7	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1120-06
CUH	9	STAIR E139	630	60	49.7	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RW-1120-06
CUH	10	SECURED ENTRY E153	630	60	49.7	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RW-1120-06
CUH	11	SECURE ENTRY A148	335	60	22.5	1.8	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1120-03
CUH	12	STAIR A175	630	60	49.7	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RW-1120-06
CUH	13	CIRCULATION F1119	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	14	VESTIBULE F119A	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	15	VESTIBULE F119A	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	16	CIRCULATION F1119	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	17	VESTIBULE F101A	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	18	VESTIBULE F101A	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RC-1200-04
CUH	19	STAIR B150	630	60	49.7	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RW-1120-06
CUH	20	ENTRY A171	845	60	53.2	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1@1/10;1@1/15	115	1	1, 2, 3, 4, 5, MODEL RC-1120-08
CUH	21	ENTRY A171	845	60	53.2	3.6	1.5	160	130	N/A	N/A	N/A	N/A	1@1/10;1@1/15	115	1	1, 2, 3, 4, 5, MODEL RC-1120-08
CUH	22	CIRCULATION A185A	430	60	29.2	2.4	1.0	160	130	N/A	N/A	N/A	N/A	1/10	115	1	1, 2, 3, 4, 5, MODEL RW-1120-04

1. SELECTION BASED ON VULCAN.
2. PROVIDE MANUAL RESET TOGGLE SWITCH STARTER W/ THERMAL OVERLOAD.
3. PROVIDE LIMITED ACCESS FASTENERS.
4. PROVIDE MANUFACTURER'S WALL SEAL FOR RECESSED MOUNTING.
5. PROVIDE HIGH CAPACITY 2-ROW COIL.

MECHANICAL PROPELLER UNIT HEATER SCHEDULE - PUH

TAG	NUMBER	LOCATION	SERVES	AIR SIDE TOTAL (CFM)	AIR SIDE EAT (F)	AIR SIDE MHT HGT (MAX)	AIR SIDE THROW (MAX)	WATER SIDE MBH	WATER SIDE GPM	WATER SIDE PD (FT WC)	WATER SIDE EWT (F)	WATER SIDE LWT (F)	MOTOR / ELECTRICAL DATA HP	MOTOR / ELECTRICAL DATA VOLT	MOTOR / ELECTRICAL DATA PHASE	REMARKS
PUH	1	BOILER ROOM	BOILER ROOM	900	60	10'	30'	31.2	2.6	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-60
PUH	2	BOILER ROOM	BOILER ROOM	900	60	10'	30'	31.2	2.6	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-60
PUH	3	MAINTENANCE	MAINTENANCE	900	60	10'	30'	31.2	2.6	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-60
PUH	4	MAIN ELECTRICAL	MAIN ELECTRICAL	900	60	10'	30'	31.2	2.6	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-60
PUH	5	AUTOMOTIVE COLLISION	AUTOMOTIVE COLLISION	2200	60	15'	55'	74.4	6.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-144
PUH	6	AUTOMOTIVE COLLISION	AUTOMOTIVE COLLISION	2200	60	15'	55'	74.4	6.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-144
PUH	7	AUTOMOTIVE COLLISION	AUTOMOTIVE COLLISION	2200	60	15'	55'	74.4	6.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-144
PUH	8	WELDING FABRICATION	WELDING FABRICATION	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	9	WELDING FABRICATION	WELDING FABRICATION	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	10	WELDING FABRICATION	WELDING FABRICATION	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	11	PRECISION MAUNFACTURING	PRECISION MANUFACTURING	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	12	PRECISION MAUNFACTURING	PRECISION MANUFACTURING	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	13	PRECISION MAUNFACTURING	PRECISION MANUFACTURING	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	14	AUTO TECHNOLOGY	AUTO TECHNOLOGY	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	15	AUTO TECHNOLOGY	AUTO TECHNOLOGY	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	16	AUTO TECHNOLOGY	AUTO TECHNOLOGY	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	17	AUTO TECHNOLOGY	AUTO TECHNOLOGY	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	18	BUILDING TRADES	BUILDING TRADES	2000	60	13'	54'	68.5	5.7	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-132
PUH	19	BUILDING TRADES	BUILDING TRADES	2000	60	13'	54'	68.5	5.7	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-132
PUH	20	BUILDING TRADES	BUILDING TRADES	2000	60	13'	54'	68.5	5.7	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-132
PUH	21	CTE EXPLORATION STUDIO	CTE EXPOLRATION STUDIO	2000	60	13'	54'	68.5	5.7	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-132
PUH	22	CTE EXPLORATION STUDIO	CTE EXPOLRATION STUDIO	2000	60	13'	54'	68.5	5.7	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-132
PUH	23	RESIDENTIAL WIRING	RESIDENTIAL WIRING	750	60	9'	30'	22.4	2.1	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-48
PUH	24	RESIDENTIAL WIRING	RESIDENTIAL WIRING	750	60	9'	30'	22.4	2.1	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-48
PUH	25	INCUBATOR C101	INCUBATOR C101	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	26	INCUBATOR C101	INCUBATOR C101	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	27	HORTICULTURE D150	HORTICULTURE D150	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	28	HORTICULTURE D150	HORTICULTURE D150	1900	60	12'	40'	56.0	5.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-120
PUH	29	FIREFIGHTING SCIENCE	FIREFIGHTING SCIENCE	2200	60	13'	55'	74.4	6.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-144
PUH	30	FIREFIGHTING SCIENCE	FIREFIGHTING SCIENCE	2200	60	13'	55'	74.4	6.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-144
PUH	31	FIREFIGHTING SCIENCE	FIREFIGHTING SCIENCE	2200	60	13'	55'	74.4	6.2	1.0	160	130	1/3	115	1	1, 2, 3, MODEL HV-144
PUH	32	FIRE-DRILL AREA E242	FIRE-DRILL AREA E242	900	60	13'	30'	31.2	2.6	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-60
PUH	33	PROP+GEAR STORAGE E243	PROP+GEAR STORAGE E243	750	60	9'	30'	22.4	2.1	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-48
PUH	34	TRACTOR INSTRUCTION	TRACTOR INSTRUCTION	750	60	9'	30'	22.4	2.1	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-48
PUH	35	PRE-ENG ROBOTICS C105	PRE-ENG ROBOTICS C105	750	60	9'	30'	22.4	2.1	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-48
PUH	36	PRE-ENG ROBOTICS C105	PRE-ENG ROBOTICS C105	750	60	9'	30'	22.4	2.1	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-48
PUH	37	STORAGE F102A	STORAGE F102A	750	60	9'	30'	22.4	2.1	1.0	160	130	1/20	115	1	1, 2, 3, MODEL HV-48

1. SELECTION BASED ON VULCAN.
2. PROVIDE MANUAL RESET TOGGLE SWITCH STARTER W/ THERMAL OVERLOAD

MECHANICAL MINI-SPLIT AIR CONDITIONING UNIT SCHEDULE - AC/ACC (6)

TAG	SERVES	COOLING CAPACITY (MBH) INDOOR / OUTDOOR	SEER INDOOR / OUTDOOR	INDOOR UNIT ELECTRICAL DATA MCA	INDOOR UNIT ELECTRICAL DATA M0CP	OUTDOOR UNIT ELECTRICAL DATA MCA	OUTDOOR UNIT ELECTRICAL DATA MOCP	POWER SUPPLY MFS	POWER SUPPLY VOLT	POWER SUPPLY PH	REMARKS
AC-18a & AC18b/ACC-18	D158 & D158A	9.6 / 18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 3, MULTIZONE SERIES HEAT PUMP MODEL 4TXM6518A1020BA
AC/ACC-1	DATA D144	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-2	DATA C114A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-3	CONTROL ROOM B103	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-4	DATA B132	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-5	SERVER B107A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-6	MIDI LAB B146	33.6	16.0	N/A	N/A	23.0	35.0		208/230	1	1, 2, 3, MODEL 4MXW8536A10N0BA
AC/ACC-7	IT SERVER / DATA A184A	33.6	16.0	N/A	N/A	23.0	35.0		208/230	1	1, 2, 3, MODEL 4MXW8536A10N0BA
AC/ACC-8	IT SERVER / DATA A184A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-9	DATA E127A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-10	EMR A165	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-11	SERVER INSTRUCTION D212A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-12	DATA D210A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-13	EMR A214A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-14	DATA E227A	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-15	DATA C223	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-16	CONTROL ROOM A282	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA
AC/ACC-17	ELECTRIC ROOM C114B	18.0	18.0	N/A	N/A	16.0	20.0		208/230	1	1, 2, 3, MODEL 4MXW8518A10N0BA

1, SELECTION BASED ON TRANE.
2. PROVIDE INTEGRAL "MINI ORANGE" CONDENSATE REMOVAL PUMP BY ASPEN PUMP. 230V AC 60HZ MOTOR TO BE POWERED VIA THE INDOOR EVAPORATOR UNIT POWER SUPPLY.
3. PROVIDE DRAIN PAN OVERFLOW DETECTION THAT IS INTERLOCKED TO SHUT DOWN INDOOR AC UNIT UPON SENSING A FULL DRAIN PAN.

MECHANICAL BLOWER COIL UNIT SCHEDULE - BCU

TAG	NUMBER	LOCATION	SERVES	TOTAL UNIT AIRFLOW (CFM)	ESP IN WG	COIL DATA / HEATING DATA EAT (F)	EWT (F)	LWT (F)	MBH	GPM	MAX PD (FT WC)	MOTOR DATA HP (WATTS)	VOLT	PHASE	REMARKS
BCU	A100	MAIN COMMON A120	VESTIBULE A100	1200	.625	50	160	120	55.7	2.8		3/4	460	3	1, MODEL LFC-30-FC-7

1. SELECTION BASED ON GREENHECK.

VRF OUTDOOR UNIT SCHEDULE - ACC

TAG	NUMBER	SERVES	LOCATION	AMBIENT AIR TEMP (F)	REFRIGERANT TYPE	NOMINAL CAPACITY (Tons)	NOMINAL HEATING CAPC. (MBH)	LECTRICAL DATA MCA	MOP	VOLT	PH	REMARKS
ACC1	1	AC1-1 THRU AC1-7	HIGH ROOF	95	R-410A	9.5	129.0	21.7	30	460	3	1, 2 MODEL 4TVH0120B400NB
ACC2	1	AC2-1 THRU AC2-5	HIGH ROOF	95	R-410A	9.5	129.0	21.7	30	460	3	1, 2 MODEL 4TVH0120B400NB
ACC3	1	AC3-1 THRU AC3-5	HIGH ROOF	95	R-410A	6.0	81.0	16.4	20	460	3	1, 2 MODEL 4TVH0072B400NB

1. SELECTION BASED ON TRANE.
2. WITH COMPLETE CONTROLS AND BACNET INTERFACE. (6)

VRF INDOOR FAN COIL UNIT SCHEDULE - AC (6)

TAG	NUMBER	LOCATION	INLET SIZE	AIR FLOW (CFM)	APD (W.G.)	NOISE CRITERIA (NC)	PIPING CONFIG.	COOLING DATA INDOOR AIR TEMP DB/WB (F)	COOLING EAT (F)	COOLING TOTAL CAPACITY (MBH)	HEATING DATA INDOOR AIR TEMP DB / WB (F)	HEATING EAT (F)	HEATING TOTAL CAPACITY (MBH)	ELECTRICAL DATA VOLT	PHASE	RATED AMPS	MCOP	REMARKS
AC1	1	D132A		494-618				80/67	70	24.0			27.0	208/230	1	0.30		1, 2, MODEL 4TVB0024B100NB
AC1	2	D132		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC1	3	D132		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC1	4	D130		283-371				80/67	70	12.0			13.5	208/230	1	.019		1, 2 MODEL 4TVB0012B100NB
AC1	5	D130		283-371				80/67	70	12.0			13.5	208/230	1	.019		1, 2 MODEL 4TVB0012B100NB
AC1	6	D128		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC1	7	D128		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC2	1	D249		494-618				80/67	70	24.0			27.0	208/230	1	0.30		1, 2 MODEL 4TVB0024B100NB
AC2	2	D245		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC2	3	D245		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC2	4	D243		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC2	5	D243		336-459				80/67	70	18.0			20.0	208/230	1	0.27		1, 2 MODEL 4TVB0018B100NB
AC3	1	C202		494-618				80/67	70	24.0			27.0	208/230	1	0.30		1, 2 MODEL 4TVB0024B100NB
AC3	2	C202		494-618				80/67	70	24.0			27.0	208/230	1	0.30		1, 2 MODEL 4TVB0024B100NB
AC3	3	C204		283-371				80/67	70	12.0			13.5	208/230	1	.019		1, 2 MODEL 4TVB0012B100NB

1. SELECTION BASED ON TRANE.
2. WITH COMPLETE CONTROLS AND BACNET INTERFACE. (6)

MECHANICAL VEHICLE EXHAUST SCHEDULE - VE

TAG	NUMBER	SERVES	LOCATION	CFM	HOSE DIA.	HOSE LENGTH	RETRACTION TYPE	ELECTRICAL DATA HP	VOLT	PH	REMARKS
VE	1	AUTO TECHNOLOGY	AUTO TECHNOLOGY	350	4"	24'	SIMPLE DROP	1/2	115	1	1, 2, MODEL 11000-FMB 5000 HOSE SERIES
VE	2	AUTO TECHNOLOGY	AUTO TECHNOLOGY	350	4"	24'	SIMPLE DROP	1/2	115	1	1, 2, MODEL 11000-FMB 5000 HOSE SERIES
VE	3	AUTO TECHNOLOGY	AUTO TECHNOLOGY	350	4"	24'	SIMPLE DROP	1/2	115	1	1, 2, MODEL 11000-FMB 5000 HOSE SERIES
VE	4	AUTO TECHNOLOGY	AUTO TECHNOLOGY	350	4"	24'	SIMPLE DROP	1/2	115	1	1, 2, MODEL 11000-FMB 5000 HOSE SERIES
VE	5	EMS TRAINING E140A	EMS TRAINING E140A	600	5"	24'	SIMPLE DROP	1.0	115	1	1, 3, MODEL 11000-FMB 4000 HOSE SERIES
VE	6	EMS TRAINING E140A	EMS TRAINING E140A	600	5"	24'	SIMPLE DROP	1.0	115	1	1, 3, MODEL 11000-FMB 4000 HOSE SERIES

1. SELECTION BASED ON MONOXIVENT.

MECHANICAL DUST COLLECTOR SCHEDULE - DC

TAG	NUMBER	SERVES	LOCATION	CFM	SP IN WC	FAN TYPE	DRIVE TYPE	ELECTRICAL DATA HP	VOLT	PH	REMARKS
DC	C138	WELDING FABRICATION	OUTDOORS	10,000	12"	CENT.	BELT	30	460	3	1, 3, 5, 8, 9, 10, 11, 12, 13 MODEL DCCH-16
DC	C117	CTE EXPLORATION STUDIO	OUTDOORS	4500	14"	CENT.	DIRECT	20	460	3	1, 4, 5, 8, 9, 10, 11, 12, 13 MODEL SCST-64-660
DC	134b	PRECISION MANUFACTURING - CYLINDRICAL GRINDER & EDM MACHINE	INDOORS	1200	-	CENT.	DIRECT	1.5	460	3	2, 16, 17, 18 MODEL 1200VOM-PG-5
DC	C127	BUILDING TRADES	OUTDOORS	8800	16"	CENT.	BELT	40	460	3	1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 MODEL DCCH-100W10
DC	134a	PRECISION MANUFACTURING	OUTDOORS	2500	10"	CENT.	DIRECT	7.5	460	3	2, 9, 10, 11, 12, 13, 14, 15 MODEL DC-6

1. SELECTION BASED ON AIREX.
2. SELECTION BASED ON AIRFLOW SYSTEMS.
3. WITH CARTRIDGE FILTERS, QUICK CAM CLAMPING SYSTEM, AUTOMATIC PULSE CLEANING SYSTEM, SURGE AIR TANK AND PHOTOHELIC GAUGE.
4. WITH BAG FILTERS AND AUTOMATIC SHAKER CLEANING SYSTEM.
5. WITH FRONT ACCESS DOORS, HOPPER, INLET TARGET PLATE, STAND, 50 GALLON DRUM KIT, MAGNEHELIC GAUGE AND FINISH PAINT.
6. WITH SERVICE PLATFORM, LADDER, CAGE AND MATCHING FINISH PAINT.
7. WITH ROTARY AIRLOCK FOR COLLECTOR DISCHARGE AND MATCHING FINISH PAINT.
8. WITH FIRE KIT INCLUDING TEMPERATURE PROBE AND PIPE (PROVISIONS ONLY FOR FUTURE).
9. WITH FRONT ACCESS DOORS, EXPLOSION RELIEF DOORS PER NFPA 68 AND MATCHING FINISH PAINT.
10. WITH SILENCER, BLOWBACK DAMPER, HIGH SPEED ABORT DAMPER AND MATCHING FINISH PAINT.
11. WITH HANSENTEK MODEL AN104 SPARK DETECTION AND SUPPRESSION SYSTEM.
12. FAN TO INCLUDE TEFC MOTOR WITH WEATHERPROOF COVER, BELTS, OSHA GUARD, BASE SUPPORT AND MATCHING FINISH PAINT.
13. WITH NEMA 12 CONTROL PANEL FOR REMOTE MOUNTING INDOORS. INCLUDING SINGLE POINT POWER CONNECTION WITH ROTARY DISCONNECT SWITCH, MAGNETIC MOTOR STARTERS WITH SOFT START, THERMAL OVERLOADS, FUSES, STEPDOWN TRANSFORMER, ILLUMINATED ON/OFF BUTTONS, 3-POSITION SELECTOR SWITCH, AUXILIARY RELAYS, TIMERS AND CONTROLLER FOR PROGRAMMABLE CLEANING SEQUENCE.
14. WITH CARTRIDGE FILTERS, QUICK CAM CLAMPING SYSTEM AND AUTOMATIC PULSE CLEANING SYSTEM.
15. WITH SHORT HOPPER, STAND, CONNECTING HOSE WITH LID AND 20 GALLON PAIL, MAGNEHELIC GAUGE AND FINISH PAINT.
16. WITH 2-INCH IMPINGEMENT FILTER, 2-INCH ALUMINUM MESH FILTER, 95% MAIN FILTER AND MAGNEHELIC GAUGE.
17. WITH WALL MOUNT/ROD HANGING BRACKETS, 3-INCH DEEP WELDED OIL SUMP, SIDE ACCESS DOOR, SILENCER AND FINISH PAINT.
18. WITH SINGLE POINT POWER CONNECTION, DISCONNECT SWITCH, MOTOR STARTER AND ON/OFF SWITCH.

MECHANICAL AIR FILTER FAN SCHEDULE - AFF

TAG	NUMBER	SERVES	LOCATION	CFM	DRIVE TYPE	FILTER DATA PRE FILTERS	FILTER DATA MAIN FILTERS	ELECTRICAL DATA HP	VOLT	PH	REMARKS
AFF	C117a	CTE EXPLORATION STUDIO	ROOM C117	2500	DIRECT	2" POLY	98% BAG	3/4	115	1	1, 2, 3, MODEL F70-R
AFF	C117b	CTE EXPLORATION STUDIO	ROOM C117	2500	DIRECT	2" POLY	98% BAG	3/4	115	1	1, 2, 3, MODEL F70-R
AFF	C127a	BUILDING TRADES	ROOM C127	2500	DIRECT	2" POLY	98% BAG	3/4	115	1	1, 2, 3, MODEL F70-R
AFF	C127b	BUILDING TRADES	ROOM C127	2500	DIRECT	2" POLY	98% BAG	3/4	115	1	1, 2, 3, MODEL F70-R
AFF	C127c	BUILDING TRADES	ROOM C127	2500	DIRECT	2" POLY	98% BAG	3/4	115	1	1, 2, 3, MODEL F70-R
AFF	C127d	BUILDING TRADES	ROOM C127	2500	DIRECT	2" POLY	98% BAG	3/4	115	1	1, 2, 3, MODEL F70-R

1. SELECTION BASED ON AIRFLOW SYSTEMS.
2. WITH DIRTY FILTER PRESSURE GUAGE KIT AND SILENCER.
3. WITH 2 SPEED MOTOR.

MECHANICAL FAN SCHEDULE - EF, KEF, DEF, CEF, SF

TAG	NUMBER	SERVES	LOCATION	CFM	ESP IN WC	FAN TYPE	DRIVE TYPE	FAN RPM	ELECTRICAL DATA HP	VOLT	PH	REMARKS
CEF	C110	SCIENCE LAB-CHEM C110 FUMEHOOD	HIGH ROOF	900	1.0	CENT. UTILITY	DIRECT	1716	3/4	115	1	1, MODEL SWD-10-VG
CEF	C114	SCIENCE LAB-CHEM C114 FUMEHOOD	HIGH ROOF	900	1.0	CENT. UTILITY	DIRECT	1716	3/4	115	1	1, MODEL SWD-10-VG
DEF	1	DISH WASH C102A KITCHEN DISHWASHER EXHAUST	HIGH ROOF	1000	0.75	ROOF CUBE UPBLAST	BELT	1322	1/2	115	1	1, MODEL CUBE-121-5
DEF	2	WARE WASH D123F CULINARY DISHWASHER EXHAUST	HIGH ROOF	1000	0.75	ROOF CUBE UPBLAST	BELT	1322	1/2	115	1	1, MODEL CUBE-121-5
EF	A108	KITCHENETTE A106_TOILET A104	HIGH ROOF	250	0.375	ROOF CENT.	DIRECT	1692	1/6	115	1	1, MODEL G-070-VG
EF	A131	DINING A131	LOW ROOF	300	0.375	ROOF CENT.	DIRECT	1721	1/10	115	1	1, MODEL G-075-VG
EF	A174	ELECTRIC ROOM A174	HIGH ROOF	350	0.375	ROOF CENT.	DIRECT	1538	1/6	115	1	1, MODEL G-085-VG
EF	A193	ELECTRIC ROOM A193	HIGH ROOF	500	0.625	ROOF CENT.	DIRECT	1669	1/6	115	1	1, MODEL G-095-VG
EF	A237	D105C, D107A, A237B, A237C TOILET ROOM	HIGH ROOF	375	0.75	ROOF CENT.	DIRECT	1695	1/6	115	1	1, MODEL G-095-VG
EF	A252	CAN WASH A252, STORAGE A254	HIGH ROOF	300	.625	ROOF CENT.	DIRECT	1692	1/10	115	1	1, MODEL SQ-85-VG
EF	B052	MAINTENANCE ROOM B052	MAINTENANCE ROOM B052	400	.25	INLINE CENT.	DIRECT	1566	1/6	115	1	1, MODEL SQ-85-VG
EF	B054	ELECTRICAL B054	ROOM B054	1000	0.5	INLINE CENT.	DIRECT	1649	1/4	115	1	1, MODEL SQ-100-VG
EF	B054B	EMERGENCY ELECTRICAL B054B	ROOM B054B	200	0.25	CABINET	DIRECT	900	48 WATTS	115	1	1, MODEL CSP-A200
EF	B149	KILN & STORAGE B149	HIGH ROOF	1200	0.625	ROOF CENT.	DIRECT	866	3/4	115	1	1, MODEL G-183-VG
EF	B215C	BATH B215C_TOILET B213	HIGH ROOF	250	.625	ROOF CENT.	DIRECT	1725	1/10	115	1	1, MODEL G-080-VG
EF	B228A	ELECTRIC ROOM B228A	HIGH ROOF	275	.25	ROOF CENT.	DIRECT	1656	1/6	115	1	1, MODEL G-070-VG
EF	C104C	TOILET ROOM C104B, C104C, CUSTODIAL C104D	HIGH ROOF	300	0.5	ROOF CENT.	DIRECT	1707	1/6	115	1	1, MODEL G-080-VG
EF	C121	SHARED FINISH ROOM HOOD	LOW ROOF	750/300	.75	CENT. UTILITY	DIRECT	2082	1/2	115	1	1, MODEL SWD-8-VG
EF	C134	PRECISION MANUFACTURING - FURNACE HOOD	LOW ROOF	800	.5	ROOF CENT.	DIRECT	1464	1/4	115	1	1, MODEL G-099-VG
EF	C202A	PRINT AREA RM C202A	CAD LAB STORAGE RM C202B	500	6.23	CENT.	DIRECT	3500	1.5	208	3	1, MODEL COMPACT GI 116
EF	C223A	ELECTRIC ROOM C223A	HIGH ROOF	275	0.25	ROOF CENT.	DIRECT	1656	1/6	115	1	1, MODEL G-070-VG
EF	D129	LOCKER D127, LOCKER D129	HIGH ROOF	450	0.75	ROOF CENT.	DIRECT	1522	1/4	115	1	1, MODEL G-098-VG
EF	D132	COSMETOLOGY D132	HIGH ROOF	225	0.5	ROOF CENT.	DIRECT	1497	1/4	115	1	1, MODEL G-097-VG
EF	D146	ELECTRIC ROOM D146	HIGH ROOF	350	0.5	ROOF CENT.	DIRECT	1677	1/6	115	1	1, MODEL G-085-VG
EF	D150B	TRACTOR INSTRUCTION D150B	ROOM D150B	200	0.25	INLINE CENT.	DIRECT	1593	1/6	115	1	1, MODEL SQ-70-VG
EF	D220	VENDING MACHINES D220	HIGH ROOF	300	0.375	ROOF CENT.	DIRECT	1721	1/10	115	1	1, MODEL G-075-VG
EF	D247	ELECTRIC ROOM D247	HIGH ROOF	275	0.25	ROOF CENT.	DIRECT	1656	1/6	115	1	1, MODEL G-070-VG
EF	E227B	ELECTRIC ROOM E227B	HIGH ROOF	625	0.625	ROOF CENT.	DIRECT	1684	1/4	115	1	1, MODEL G-098-VG
EF	E242	FIRE-DRILL AREA E242	HIGH ROOF	3000	.75	ROOF CENT.	DIRECT	1080	2	208	1	1, MODEL CUE-180-VG
KEF	1	MAIN KITCHEN C102 EXHAUST HOOD	HIGH ROOF	7155	1.5	ROOF CUBE UPBLAST	BELT	917	5	460	3	1, MODEL CUBE-300HP-50
KEF	2	BAKE LAB D123 EXHAUST HOOD	LOW ROOF	3375	1.0	ROOF CUBE UPBLAST	BELT	1214	2	460	3	1, MODEL CUBE-180HP-20
KEF	3	CULINARY ARTS D123A EXHAUST HOOD	HIGH ROOF	4162	1.5	ROOF CUBE UPBLAST	BELT	1418	3	460	3	1, MODEL CUBE-200HP-30
KEF	4	FACS LAB D112 EXHAUST HOOD	HIGH ROOF	2760	1.25	ROOF CUBE UPBLAST	DIRECT	1426	2	208	1	1, MODEL CUE-161-VG
KEF	5	FACS LAB D112 EXHAUST HOOD	HIGH ROOF	1258	1.0	ROOF CUBE UPBLAST	DIRECT	1594	1/2	115	1	1, MODEL CUE-121-VG
KEF	6	FACS LAB D112 EXHAUST HOOD	HIGH ROOF	1990	1.0	ROOF CUBE UPBLAST	DIRECT	1549	1	115	1	1, MODEL CUE-141-VG
KEF	7	ECE KITCHEN A143A EXHAUST HOOD	HIGH ROOF	968	1.0	ROOF CUBE UPBLAST	DIRECT	2500	1/2	115	1	1, MODEL CUE-101HP-VG
KEF	8	LS APARTMENT B215 EXHAUST HOOD	HIGH ROOF	550	0.75	ROOF CUBE UPBLAST	DIRECT	1468	1/4	115	1	1, MODEL CUE-099-VG
SF	E242	FIRE-DRILL AREA E242	HIGH ROOF	1500	0.75	ROOF FILTERED SUPPLY	BELT	772	1/2	115	1	1, MODEL RSF-100-5

REFER TO ASSOCITED FAN NOTES BELOW. ALL SELECTIONS BASED ON GREENHECK.

EF NOTES ONLY

1. SELECTION BASED ON GREENHECK.
2. MOTOR - VARI-GREEN EC MOTOR W/MOUNTED POTENTIOMETER DIAL
3. SWITCH, NEMA-1, TOGGLE, SHIPPED WITH UNIT
5. JUNCTION BOX MOUNTED & WIRED.
4. ROOF CURB-GALV., GPI-30-G18, UNDER SIZED 1.5 IN. TOTAL, CURB SEAL (ATTACHED).
5. DAMPER SHIPPED LOOSE, GRAVITY OPERATED, NOT COATED.
6. WIRING PIGTAIL, INTERNAL, GENERAL, 9 FT FROM UNIT OF FLEXIBLE METAL CONDUIT.
7. BIRDSCREEN: ALUMINUM.
8. TIE DOWN POINTS - SET OF 4 (ATTACHED), STANDARD FASTENERS.

CEF & SF NOTES ONLY

9. SPARK B CONSTRUCTION.
10. PAINTED STEEL HOUSING MATERIAL.
11. ALUMINUM WHEEL CONSTRUCTION, MILL FINISH.
12. ALUMINUM INLET CONE, MILL FINISH.
13. UL/CUL 705 LISTED - "POWER VENTILATORS".
14. ISOLATORS (QTY:4), RESTRAINED SPRING MOUNT FOR INDOOR/OUTDOOR USE, SINGLE DEFLECTION 1.0 IN. (6)
15. EQUIPMENT SUPPORTS (QTY:2), GESS-35-4-G8.
16. WEATHERHOOD.
17. COATED WITH PERMATECTOR, CONCRETE GRAY-RAL 7023, STANDARD COATING ON ENTIRE FAN.
18. HINGED ACCESS DOOR.
19. THREADED PIPE DRAIN CONNECTION,1 IN. DIAMETER.
20. COMPANION FLANGE - INLET (INCLUDES INLET FLANGE).
21. OUTLET FLANGE - PUNCHED.
22. OUTLET GUARD.
23. SHAFT SEAL W/RUB RING.

DEF & KEF NOTES ONLY

24. NEMA PREMIUM EFFICIENT MOTOR - MEETS NEMA TABLE 12-12
25. MOTOR VFD RATED WITHOUT SHAFT GROUNDING PROTECTION
26. AUTOMATIC BELT TENSIONER
27. GRIP NOTCH BELT(S)
28. SPARE BELT(S) - 2 SETS (ATTACHED)
29. UL/CUL 762 LISTED - "POWER VENTILATORS FOR REST. EXH. APPLIANCES"
30. SWITCH, NEMA-1, TOGGLE, SHIPPED WITH UNIT
31. JUNCTION BOX MOUNTED & WIRED
32. ROOF CURB-GALV., GPF-40-G24, UNDER SIZED 1.25 IN. TOTAL
33. HINGED CURB CAP KIT W/CABLES (PN 853443) & SUPPORT BRACKET (SHIPPED LOOSE)
34. COATED WITH PERMATECTOR, CONCRETE GRAY-RAL 7023, FAN AND ATTACHED ACC
35. NON-STICK COATED WHEEL (TEFLON)
36. WIRING PIGTAIL, EXTERNAL, GENERAL, 9 FT FROM UNIT OF NON-METALLIC LIQUID-TITE
37. EXTENDED LUBE LINES
38. DRAIN CONNECTION
39. HEAT BAFFLE (ATTACHED)
40. BEARINGS WITH GREASE FITTINGS, L10 LIFE OF 100,000 HRS (L50 AVG. LIFE 500,000 HRS)
41. CLEAN-OUT PORT
42. UNIT WARRANTY: 1 YR (STANDARD)

MECHANICAL SMOKE EVACUATION FAN SCHEDULE - SSF, SEF

TAG	NUMBER	SERVES	LOCATION	MAX CFM	SP IN WC	FAN TYPE	DRIVE TYPE	FAN RPM	ELECTRICAL DATA HP	VOLT	PH	REMARKS
SEF	1	ATRIUM SMOKE EXHAUST	HIGH ROOF	47,500	1.25	AIR FOIL	BELT	797	30	460	3	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, MODEL 49CSW-AF-21-10-1-300
SEF	2	ATRIUM SMOKE EXHAUST	HIGH ROOF	45,000	1.25	AIR FOIL	BELT	762	30	460	3	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, MODEL 49CSW-AF-21-10-1-300
SEF	3	ATRIUM SMOKE EXHAUST	HIGH ROOF	40,000	1.0	AIR FOIL	BELT	678	25	460	3	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, MODEL 49CSW-AF-21-10-1-250
SSF	1	ATRIUM SMOKE EXHAUST MAKE-UP AIR	HIGH ROOF	3,500	.625	BACKWARD INCLINE	DIRECT	1770	2	460	3	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, MODEL 16-CSW-BI-41-100-I-20
SSF	2	ATRIUM SMOKE EXHAUST MAKE-UP AIR	HIGH ROOF	3,500	.625	BACKWARD INCLINE	DIRECT	1770	2	460	3	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, MODEL 16-CSW-BI-41-100-I-20

1. SELECTION BASED ON GREENHECK.
2. MOTOR VFD RATED WITHOUT SHAFT GROUNDING PROTECTION
3. MOTOR SIZED FOR FAN RPM OPERATION WITH VFD, NOT POWER LINE HZ
4. MOTOR WITH CLASS B INSULATION
5 COATED WITH PERMATECTOR, CONCRETE GRAY-RAL 7023, FAN AND ATTACHED ACCESSORIES
6. FAN MONITORING SYSTEM, CURRENT SENSOR PACKAGE, 100 - 240 VAC, SHIPS LOOSE
7. DIRECT MOUNT ISOLATORS, ISOLATOR-SPRING, FREE STANDING, 1 INCH, BASE COATING - N/A
8. HOUSING - WELDED SCROLL
9. ACCESS DOOR - HINGED
10. DRAIN CONNECTION - 1" PIPE THREAD W/PLUG
11. SURE-AIRE FLOW STATION (WITH ELECTRONICS), 100-240VAC
12. INLET CONNECTION - PUNCHED WITH COMPANION FLANGE
13. OUTLET CONNECTION - OUTLET FLANGE, PUNCHED
14. MOTOR COVER, STEEL
15. OUTLET GUARD - OUTLET GUARD, STEEL, COATED W/SAFETY YELLOW FNISH
16. INLET GUARD - INLET GUARD, GALVANIZED
17. FASTENERS - STANDARD
18. NEMA PREMIUM EFFICIENT MOTOR - MEETS NEMA TABLE 12-12
19. MOTOR VFD RATED WITHOUT SHAFT GROUNDING PROTECTION
20. MOTOR WITH CSA APPROVAL
21. MOTOR WITH MINIMUM 40 DEGREE C AMBIENT TEMPERATURE
22. MOTOR WITH CLASS F INSULATION
23. SPARE BELTS - 2 SETS
24. SWITCH - NEMA-1, TOGGLE, FOR INDOOR USE ONLY, SHIP SEPARATE
25. BEARINGS - L(10) LIFE OF 80K HOURS
26. HOUSING - PERMALOCK
27. UL LISTED FOR SMOKE EXHAUST (500F/4HR, 1000F/15 MIN)
28. DAMPER, OUTLET VOLUME, HCD-230, GALV. BLADE, OPPOSED, MANUAL QUADRANT, W/ MILL FINISH
29. EXTENDED LUBE LINES - COPPER
30. WEATHERHOOD - STEEL
31. HEAT SLINGER
32. SHAFT SEAL - HIGH TEMPERATURE
33. FASTENERS - STANDARD

MECHANICAL DRYER BOOSTER FAN SCHEDULE - DBF

TAG	NUMBER	SERVES	LOCATION	CFM	SP IN WC	FAN TYPE	DRIVE TYPE	FAN RPM	ELECTRICAL DATA WATTS	VOLT	PH	REMARKS
DBF	D132C	DRYER IN ROOM D132C	LOCKER RM D132C	120	0.5	INLINE CENT.	DIRECT	2800	75	115	1	1, 2, 3, 4, MODEL DBF4XL
DBF	D112	DRYER IN ROOM D112	FACS CULINARY LAB D112	120	0.5	INLINE CENT.	DIRECT	2800	75	115	1	1, 2, 3, 4, MODEL DBF4XL
DBF	D132D	DRYER IN ROOM D132D	LINEN/CLEANING D132D	120	0.5	INLINE CENT.	DIRECT	2800	75	115	1	1, 2, 3, 4, MODEL DBF4XL
DBF	C104D	DRYER IN ROOM C104D	CUSTODIAL C104D	120	0.5	INLINE CENT.	DIRECT	2800	75	115	1	1, 2, 3, 4, MODEL DBF4XL
DBF	E126A	DRYER IN ROOM E126A	DRYER IN ROOM E126A	120	0.5	INLINE CENT.	DIRECT	2800	75	115	1	1, 2, 3, 4, MODEL DBF4XL

1. SELECTION BASED ON FANTEC.
2. DBFXL KIT INCLUDES: FX4XL FAN, DB10 SWITCH W/ INTEGRAL RELAY AND MBFAN MOUNTING BRACKET & HARDWARE.
3. WITH SPEED CONTROLLER.
4. BOOSTER FAN TO BE LOCATIED A MINIMUM OF 15 LINEAR FEET AWAY FROM DRYER OUTLET.

LAVALLEE BRENSINGER ARCHITECTS
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305 Commercial Street, Portland, ME 04101
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RFS Project #: 7300.001

STATE OF MAINE
CHRISTOPHER M. SHUMWAY
No. 10820
LICENSED PROFESSIONAL ENGINEER

Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
5	ADDENDUM #5	2016-03-17
6	ADDENDUM #6	2016-03-23

CONTENT:
MECHANICAL SCHEDULES

DRAWN BY:	S. DANBY
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	NO SCALE

M5.02

Project Phase
BID DOCUMENTS

FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

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MECHANICAL DUCT MOUNTED HEATING COIL SCHEDULE - HC

TAG	NUMBER	LOCATION	SERVES	ASSOCIATED MECHANICAL DHU UNIT	CFM	DUCT WIDTH	DUCT HEIGHT	HEATING COIL DATA MAX APD (W.C.)	EAT (F)	LAT (F)	EWT (F)	LWT (F)	GPM	MBH	MAX WPD (W.C.)	REMARKS
HC	A120a	A120	MAIN COMMON A120	DHU 12	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	A120b	A120	MAIN COMMON A120	DHU 12	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	A120c	A120	MAIN COMMON A120	DHU 12	900	24	16	0.3	40	80	160	120	2.0	38.9	1.0	
HC	A121B	A121B	LIBRARY RES. A127	DHU 12	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	A127	A127	LIBRARY RES. A127	DHU 12	200	10	8	0.3	40	80	160	120	0.5	8.7	1.0	
HC	A140	A140	ECE INSTR A140	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	A141	A140A	OFFICE A141	DHU 8	100	6	6	0.3	40	80	160	120	0.5	4.3	1.0	
HC	A143	143	ECE 143	DHU 8	1200	24	18	0.3	40	80	160	120	2.6	51.9	1.0	
HC	A143A	A143	ECE KITCHEN A143A	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	A144	A143	ECE A143	DHU 12	150	6	6	0.3	40	80	160	120	0.5	6.5	1.0	
HC	A170	A170	CORRIDOR A170	DHU 12	1200	24	18	0.3	40	80	160	120	2.6	51.9	1.0	
HC	A178	A178	CAFE/CONN. A178	DHU 12	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	A182	A180	IT OFFICE A182	DHU 12	550	14	14	0.3	40	80	160	120	1.2	23.8	1.0	
HC	A220a	A220	MAIN COMMON A220	DHU 12	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	A220a	A220	MAIN COMMON A220	DHU 12	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	A220b	A220	MAIN COMMON A220	DHU 12	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	A260	A270	JOBS FOR GRADS A260	DHU 12	200	10	8	0.3	40	80	160	120	0.5	8.7	1.0	
HC	A268	A268	ED TECH OFFICES (10) A268	DHU 12	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	A270a	A270	CORRIDOR A270	DHU 12	600	12	10	0.3	40	80	160	120	1.3	25.9	1.0	
HC	A270b	A270	CORRIDOR A170	DHU 1A	900	24	16	0.3	40	80	160	120	2.0	38.9	1.0	
HC	A282	A268	CONTROL ROOM A282	DHU 12	100	6	6	0.3	40	80	160	120	0.5	4.3	1.0	
HC	B052	B058	MAINT. B052	DHU 1A	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	B055	B058	CUST. OFF. B055	DHU 1B	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	B120a	B120	CORR. B120	DHU 1B	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	B120b	B140	A+G LIBRARY B120A	DHU 1B	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	B127	B127	FINE ART B127	DHU 1B	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	B130	B130	OFFICE B130	DHU 1B	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	B139	B127A	OFFICE B139	DHU 1B	150	6	6	0.3	40	80	160	120	0.5	6.5	1.0	
HC	B140B	B140B	PRACT B140B B140C B140D	DHU 1B	90	6	6	0.3	40	80	160	120	0.5	4.1	1.0	
HC	B141	B141	FINE ART B141	DHU 1B	600	24	16	0.3	40	80	160	120	1.3	25.9	1.0	
HC	B142	B142A	BAND B142	DHU 1B	900	24	16	0.3	40	80	160	120	2.0	38.9	1.0	
HC	B142A	B142A	BAND STORAGE	DHU 1B	250	10	8	0.3	40	80	160	120	0.6	10.8	1.0	
HC	B144	B144	CHORUS	DHU 1B	900	24	16	0.3	40	80	160	120	2.0	38.9	1.0	
HC	B144A	B144A	MUSIC OFF. B144A	DHU 1B	100	6	6	0.3	40	80	160	120	0.5	4.3	1.0	
HC	B146	B146	MIOILAB BI46	DHU 1B	300	12	10	0.3	40	80	160	120	0.7	13.0	1.0	
HC	B147	B147	POTTERY 147	DHU 1B	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	B220	B220	CORR. B220	DHU 1A	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	B235	B235	CLASS B235	DHU 1A	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	B237	B237	CLASS B237	DHU 1A	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	B238	B238	CLASS B238	DHU 1A	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	B241	B241	OFFICE B241 &B231	DHU 1A	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	B243	B243	CLASS B243	DHU 1A	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	B244	B244	CLASS B244	DHU 1A	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	B245	B245	CLASS B245	DHU 1A	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	B246	B246	CLASS B246	DHU 1A	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	B247	B245	OFFICE(3)/PREP B247	DHU 1A	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	B249	B249	SCI LAB B249	DHU 1A	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C101	C101	INCUBATOR C101	DHU 3	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C105	C105A	ROBOTICS C105	DHU 3	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C108	C106	OFFICE C108	AHU 6	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C110	C110	SCI LAB C110	DHU 3	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C110A	C110A	OFFICE C112 & PREP C110A	DHU 3	250	10	8	0.3	40	80	160	120	0.6	10.8	1.0	
HC	C113A	C113A	INSTRUCTION C113A	DHU 3	500	14	14	0.3	40	80	160	120	1.1	21.6	1.0	
HC	C114	C114	SCI LAB C114	DHU 3	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C115	C115	RES WIRING C115	DHU 3	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C117	C117	INSTRUCTIONAL C117A	DHU 3	500	14	14	0.3	40	80	160	120	0.7	16.2	1.0	
HC	C117A	C117A	CTE EXP. C117	DHU 3	1800	24	18	0.3	40	80	160	120	3.9	77.8	1.0	
HC	C120	C120	CORR. C120	DHU 3	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	C120	C134	SCIENCE & TECHNOLOGY C120	DHU 4	1200	24	18	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C120A	C120A	S&T LAB C120A	DHU 3	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C120b	C120	TECH CORR C120	DHU 3	1200	12	10	0.3	40	80	160	120	2.6	51.9	1.0	
HC	C121	C127B	FINISHING RM C121	DHU 5	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	C124	C124	SCIENCE LAB C124	DHU 3	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C125	C120A	OFFICE C125 & C119	DHU 3	225	10	8	0.3	40	80	160	120	0.6	10.8	1.0	
HC	C127a	C133	BUILDING TRADES C133	DHU 5	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C127b	C133	BUILDING TRADES C133	DHU 5	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C132	C132	OFFICE C132	DHU 5	100	6	6	0.3	40	80	160	120	0.5	4.3	1.0	
HC	C133A	C133a	AUTO TECH C133A	DHU 5	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	C133a	C133	AUTO TECH & C133	DHU 5	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C133b	C133	AUTO TECH C133	DHU 5	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C134A	C134A	INSTRUCTOR C134A	DHU 4	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C134a	C134	PRECISION MGT	DHU 4	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C134b	C134	PRECISION MGT	DHU 4	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C134c	C134C	INSPECTION C134C	DHU 4	200	6	6	0.3	40	80	160	120	0.5	8.7	1.0	
HC	C135	C139A	OFFICES C135 & C135A	DHU 5	100	10	8	0.3	40	80	160	120	0.5	4.3	1.0	
HC	C136	C136	OFFICE C136	DHU 4	150	6	6	0.3	40	80	160	120	0.5	6.5	1.0	
HC	C138A	C138A	WELDING CLASS C138A	DHU 4	500	14	14	0.3	40	80	160	120	0.7	16.2	1.0	
HC	C138a	C134	WELDING FABRICATION C138	DHU 4	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C138b	C134	WELDING FABRICATION C138	DHU 4	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C139A	C139A	COLLISION INS & C139A	DHU 5	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	C139a	C139	AUTO COLLISION C139	DHU 5	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C139B	C139B	AUTO COLLISION C139	DHU 5	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	C139b	C139	STORAGE C139 & C139C	DHU 5	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	C202	C202	CAD LAB C202	DHU 2	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	C205	C205	PROJ CLASS C205	DHU 12	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C206	C206	CLASS C206	DHU 2	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C207	C207	STORAGE C207 & C209	DHU 2	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	C208	C208	CLASS C208	DHU 2	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C212	C212	CLASS C212	DHU 2	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C214	C214	CLASS C214	DHU 2	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C218	C218	OFFICE C218	DHU 2	200	10	8	0.3	40	80	160	120	0.5	8.7	1.0	
HC	C219	C220	TOILET C219 & C221	DHU 2	600	12	10	0.3	40	80	160	120	1.3	25.9	1.0	
HC	C220a	C220	CORR C220	DHU 2	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	C220b	C220	CORR C220	DHU 2	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	C224	C224	CLASS C224	DHU 2	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	C225	C225	OFFICE C225	DHU 2	300	12	10	0.3	40	80	160	120	0.7	13.0	1.0	
HC	D113	D113	CLASS D113	DHU 6B	400	12	10	0.3	40	85	160	120	1.0	19.5	1.0	
HC	D117A	D117A	CLASS D117A	DHU 6B	400	12	10	0.3	40	85	160	120	1.0	19.5	1.0	
HC	D117B	C117B	CLASS D117B	DHU 6B	400	12	10	0.3	40	85	160	120	1.0	19.5	1.0	
HC	D120	D130	CORR D130	DHU 6B	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D120A	D117B	PATHWAY LIBRERY D120A	DHU 6B	500	14	14	0.3	40	80	160	120	0.7	16.2	1.0	
HC	D122	D122	BUSIMESS/MATH D122	DHU 6B	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D128	D128	BUSINESS D128	DHU 6B	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D130	D130	BUSINESS/BANK D130	DHU 6B	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D132	D132	COSM. LAB D132	DHU 6B	1200	24	18	0.3	40	80	160	120	2.6	51.9	1.0	
HC	D132A	D132C	COSM. D132A	DHU 6B	520	14	14	0.3	40	80	160	120	0.7	16.2	1.0	
HC	D134	D132	OFFICE D134 & DISPENSORY D132B	DHU 6B	350	12	10	0.3	40	80	160	120	0.8	17.0	1.0	
HC	D140	D140	PUBLIC LOBBY D140	DHU 6B	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D150	D150C	HORTICULTURE D150	DHU 6B	100	24	18	0.3	40	80	160	120	0.5	4.3	1.0	
HC	D150A	D150	INSTRUCTIONAL D150A	DHU 6B	250	10	8	0.3	40	80	160	120	0.6	10.8	1.0	
HC	D158	D150A	RECP. D158 & SRO OFFICE D158A	DHU 6B	100	6	6	0.3	40	80	160	120	0.5	4.3	1.0	
HC	D213	D213	CLASS D213	DHU 7	400	12	10	0.3	40	90	160	120	1.1	21.6	1.0	
HC	D217	D217	CLASS D217	DHU 7	400	12	10	0.3	40	90	160	120	1.1	21.6	1.0	
HC	D219	D219	BIO SCI LAB D219	DHU 7	1200	24	18	0.3	40	80	160	120	2.6	51.9	1.0	
HC	D221	D221	OFFICE D221 & D225	DHU 7	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	D222	D222	CLASS D222	DHU 7	400	12	10	0.3	40	85	160	120	1.0	19.5	1.0	
HC	D227	D233	PREP ROOM D227	DHU 7	250	10	8	0.3	40	80	160	120	0.6	10.8	1.0	
HC	D228	D228	CLASS D228	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D230	D230	CLASS D230	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D233	D233	BIO SCI LAB D233	DHU 7	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	D237	D237	EARTH SCI CLASS D237	DHU 7	1000	24	16	0.3	40	80	160	120	2.2	43.3	1.0	
HC	D238	D238	CLASS D238	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D240	D240	OFFICE D240	DHU 7	150	6	6	0.3	40	80	160	120	0.5	6.5	1.0	
HC	D241	D241	OFFICE D241	DHU 7	100	14	14	0.3	40	80	160	120	0.5	4.3	1.0	
HC	D242	D242	CLASS D247	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D243	D243	BUS SER D243	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D244	D244	CLASS D244	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D245	D245	MARKETING/MANG D245	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	D249	D249	CONF D249	DHU 7	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E102	E102	OFFICE E102	DHU 8	150	6	6	0.3	40	80	160	120	0.5	6.5	1.0	
HC	E104	E104	FACS FASHION E104	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E118	E118	HEALTH OCC E118	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E120A	E121	PATHWAY LIB E120A	DHU 8	1000	18	18	0.3	40	80	160	120	2.2	43.3	1.0	
HC	E121	E121	CLASS E121	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E123A	E123A	CLASS E123A	DHU 8	400	12	10	0.3	40	90	160	120	1.1	21.6	1.0	
HC	E123B	E123B	CLASS E123B	DHU 8	400	12	10	0.3	40	90	160	120	1.1	21.6	1.0	
HC	E124	E126	E124, E126A & E122	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E127	E127	CLASS E127	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E128	E128	HEALTH OCC E128	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E128A	E128	TRAINING THT E128A E1181	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E140	E140 (HIGH)	FIRE SCIENCE E140	DHU 9	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	E142	E142	FIRE INST E142	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E143	E143	EMS INST E143	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E145A	E140B	FIRE OFFICE E145A & EMS SIM E143A	DHU 9	250	10	8	0.3	40	80	160	120	0.6	10.8	1.0	
HC	E148	E148	OFFICE E148 & E151	DHU 9	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E150	E150	COMMON E150	DHU 9	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E152	E152	CLASS E152	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E153	E153	CLASS E153	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E155	E150	SM GROUP E155 & E156	DHU 9	200	10	8	0.3	40	80	160	120	0.5	8.7	1.0	
HC	E157	E157	CLASS E157	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E159	E159	OFFICE E159 & E158	DHU 9	150	6	6	0.3	40	80	160	120	0.5	6.5	1.0	
HC	E212	E212	SCI BIO LAB E212	DHU 8	1200	24	18	0.3	40	80	160	120	2.6	51.9	1.0	

1. SELECTION BASED ON TRANE.

MECHANICAL DUCT MOUNTED HEATING COIL SCHEDULE - HC

TAG	NUMBER	LOCATION	SERVES	ASSOCIATED MECHANICAL DHU UNIT	CFM	DUCT WIDTH	DUCT HEIGHT	HEATING COIL DATA MAX APD (W.C.)	EAT (F)	LAT (F)	EWT (F)	LWT (F)	GPM	MBH	MAX WPD (W.C.)	REMARKS
HC	E213	E213	ENG/SPEC E213	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E215	E215	OFFICE E215	DHU 8	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E216	E214	OFFICE E216 & E214	DHU 9	425	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E220a	E220	CORR E220	DHU 8	400	14	14	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E220b	E220	CORR E220	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E221	E221	SCI CLASS E221	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E222	E222	SCI-BIO E222	DHU 9	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	E223	E223	CLASS E223	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E224A	E226	OFFICE 224A	DHU 9	100	6	6	0.3	40	80	160	120	0.5	4.3	1.0	
HC	E225	E225	CLASS E225	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E227	E227	CLASS E227	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E228	E228	CRIMINAL JUSTICE E228	DHU 9	600	14	14	0.3	40	80	160	120	1.3	25.9	1.0	
HC	E242a	E242	FIRE DRILL E242	DHU 8	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E242b	E242	SF-E242	N/A	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	E248	E248	OFFICE E248	DHU 9	200	10	8	0.3	40	80	160	120	0.5	8.7	1.0	
HC	E250	E250	ALT ED COMMONS E250	DHU 9	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	E251	E251	CLASS E251	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E252	E251	CLASS E252	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E255	E250	SM GROUP E255	DHU 9	150	6	6	0.3	40	80	160	120	0.5	6.5	1.0	
HC	E256	E250	CLASS E256	DHU 9	300	10	8	0.3	40	80	160	120	0.7	13.0	1.0	
HC	E259	E250A	OFFICE E259	DHU 9	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	F100	288	OFFICE F100	DHU 12	1200	24	16	0.3	40	80	160	120	2.6	51.9	1.0	
HC	F111	F111	CIR F111 & OFFICE F106A & F106	DHU 10	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	F119	F119	CIRC F119	DHU 10	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	F121	F123	CLASS F121	DHU 11	400	12	10	0.3	40	80	160	120	0.9	17.3	1.0	
HC	F123	F125	HEALTH LAB F123	DHU 11	600	14	14	0.3	40	90	160	120	1.6	32.4	1.0	
HC	F125	F125	WEIGHT RM F125	DHU 11	900	18	18	0.3	40	90	160	120	2.5	48.6	1.0	
HC	F126	F128	MULT PURP F126	DHU 11	1500	24	18	0.3	40	80	160	120	3.3	64.8	1.0	
HC	F127	F127	PE TRAINING F127	DHU 11	400	12	10	0.3	40	85	160	120	1.0	19.5	1.0	
HC	F128	F128	CORR F128	DHU 11	900	18	18	0.3	40	80	160	120	2.0	38.9	1.0	
HC	F131	F131	LOCKER F131	DHU 10	600	14	14	0.3	40	105	160	120	2.1	42.3	1.0	
HC	F134	F135	OFFICE F132 & F134	DHU 10	200	10	8	0.3	40	80	160	120	0.5	8.7	1.0	
HC	F135	F135	LOCKER RM F135	DHU 10	900	18	18	0.3	40	105	160	120	3.2	63.5	1.0	
HC	F136	F136	TEAM RM F136	DHU 10	600	14	14	0.3	40	105	160	120	2.1	42.3	1.0	
HC	F141	F141	LOCKER RM F141	DHU 10	900	18	18	0.3	40	105	160	120	3.2	63.5	1.0	
HC	F144	F141	OFFICE F142 & F144	DHU 10	200	10	8	0.3	40	80	160	120	0.5	8.7	1.0	
HC	F145	F145	LOCKER RM F145	DHU 10	600	14	14	0.3	40	105	160	120	2.1	42.3	1.0	
HC	F146	F146	TEAM RM F146	DHU 10	600	14	14	0.3	40	105	160	120	2.1	42.3	1.0	

1. SELECTION BASED ON TRANE.

MECHANICAL VARIABLE/CONSTANT AIR VOLUME BOX SCHEDULE - SV

TAG	NUMBER	LOCATION	SERVES	ASSOCIATED MECHANICAL AHU UNIT	MIN CFM	MAX CFM	UNIT SIZE	INLET SIZE IN	OUTLET SIZE IN	MIN. SP IN WC	MAX NC	HEATING COIL DATA EAT (F)	LAT (F)	EWT (F)	LWT (F)	GPM	MBH	MAX APD (W.C.)	MAX PD (FT WC)	REMARKS
SV	A101A	A101A	RECEPTION/WRITING A101A	9	250	630	10	10Ø	14 x 12	.05	20	50	85	160	120	0.5	9.5	0.6	2.0	1, 2
SV	A102	A102	AP DEAN STUDENTS A102	9	100	150	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A103	A103	AP TRUANT A103	9	150	350	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.7	0.6	2.0	1, 2
SV	A107	A109	PRINC CONF A109	9	120	300	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	4.1	0.6	2.0	1, 2
SV	A108A	A108A	WORK AREA A108A	9	260	650	10	10Ø	14 x 12	.05	20	50	85	160	120	0.6	10.6	0.6	2.0	1, 2
SV	A109	A109	PRINC A109	9	100	225	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A110	A110	CTE ADMIN A110	7	200	400	6	6Ø	10 x10	.08	22	50	85	160	120	0.6	7.6	0.6	2.0	1, 2
SV	A111	A111	DIRECTOR A111	7	100	200	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A112	A112	OUTREACH CONF A112	7	150	400	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.7	0.6	2.0	1, 2
SV	A116	A116	AS RECORD A116	7	100	150	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A117	A117	CTE GUIDANCE A115, AS OFF. A113	7	150	300	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.7	0.6	2.0	1, 2
SV	A118	A118	TEACHER WK RM ALL 8	7	100	165	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A122	A122	LIB STACK A122	9	600	1475	12	12Ø	18 x 15	.05	20	50	85	160	120	1.2	22.7	0.6	2.0	1, 2
SV	A125	A143B	OFFICE A125	9	140	325	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.3	0.6	2.0	1, 2
SV	A126	A126	LIB CONF A126	9	150	400	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.7	0.6	2.0	1, 2
SV	A131	A131	DININ A131	7	550	1000	10	10Ø	14 x 12	.05	20	50	85	160	120	0.7	13.0	0.6	2.0	1, 2
SV	A133A	A133A	FACULTY LOUNGE A133A	7	300	800	10	10Ø	14 x 12	.05	20	50	85	160	120	0.6	11.4	0.6	2.0	1, 2
SV	A135	A135A	TECH HUB	7	85	275	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.3	0.6	2.0	1, 2
SV	A160	A160	SM CONF A160	9	120	380	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	4.6	0.6	2.0	1, 2
SV	A201	A201	SPEC EO A201	9	175	430	8	8Ø	12 x 10	.04	20	50	85	160	120	0.5	6.8	0.6	2.0	1, 2
SV	A203	A203	OFFICE A202, ASST DIR A203	9	110	275	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	4.1	0.6	2.0	1, 2
SV	A204	A204	DIR OFFICE A204	9	100	225	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A205	A205	CONF RM A205	9	150	300	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.7	0.6	2.0	1, 2
SV	A206	A206	OFFICE A206 & A207	9	150	270	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.7	0.6	2.0	1, 2
SV	A210	A210	GUIDENCE RECP A210	7	200	300	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	7.6	0.6	2.0	1, 2
SV	A211D	A211F	GUID OFF A211F, A211B, A211C, AT RISK A211B	7	275	575	8	8Ø	12 x 10	.04	20	50	85	160	120	0.6	10.6	0.6	2.0	1, 2
SV	A211H	A211H	DIR OFF A211H	7	100	200	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A212	A212	SM MEETING A212, AT RISK A211A	7	105	340	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A218	A218	SHARED CONF A218		180	380	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	6.8	0.6	2.0	1, 2
SV	A222	A222	ELO A222, VIRTUAL PATH A227, PSY OFF A225	9	225	450	8	8Ø	12 x 10	.04	20	50	85	160	120	0.5	8.5	0.6	2.0	1, 2
SV	A224	A224	LEARNING CENTER A224	9	350	875	10	10Ø	14 x 12	.05	20	50	85	160	120	0.7	13.3	0.6	2.0	1, 2
SV	A228	A228	FACULTY TRAINING A228	9	280	700	10	10Ø	14 x 12	.05	20	50	85	160	120	0.6	10.6	0.6	2.0	1, 2
SV	A231	A231	CAREER PLANNING	7	600	1480	12	12Ø	18 x 15	.05	20	50	85	160	120	1.2	22.7	0.6	2.0	1, 2
SV	A234	A231	OFFICE A234, A233, A232	7	225	520	8	8Ø	12 x 10	.04	20	50	85	160	120	0.5	8.5	0.6	2.0	1, 2
SV	A237A	A237A	STUD WK STATIONS A237A	7	225	550	8	8Ø	12 x 10	.04	20	50	85	160	120	0.5	8.5	0.6	2.0	1, 2
SV	A238	A236	VP DISIPLINE A236 & A238	7	140	300	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.3	0.6	2.0	1, 2
SV	A239	A239	LG MEETING A239	7	225	450	8	8Ø	12 x 10	.04	20	50	85	160	120	0.5	8.5	0.6	2.0	1, 2
SV	A240	A244	SPECIAL EDU COMMON A240	9	350	800	10	10Ø	14 x 12	.05	20	50	85	160	120	0.7	13.3	0.6	2.0	1, 2
SV	A241	A241	RESOURCE RM A241	9	350	800	10	10Ø	14 x 12	.05	20	50	85	160	120	0.7	13.3	0.6	2.0	1, 2
SV	A242	A228	RESOURCE RM A242	9	350	800	10	10Ø	14 x 12	.05	20	50	85	160	120	0.7	13.3	0.6	2.0	1, 2
SV	A243	A243	RESOURCE RM A243	9	350	800	10	10Ø	14 x 12	.05	20	50	85	160	120	0.7	13.3	0.6	2.0	1, 2
SV	A244	A244	ACADEMIC SUPP A244	9	100	275	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	A245	A245	EMOT DISABILTY	9	350	800	10	10Ø	14 x 12	.05	20	50	85	160	120	0.7	13.3	0.6	2.0	1, 2
SV	B101	B101	VIDEO PROD LAB B101	5	400	1000	10	10Ø	14 x 12	.05	20	50	85	160	120	0.8	15.2	0.6	2.0	1, 2
SV	B103	B103	CONTROL RM B103	5	75	250	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	4.1	0.6	2.0	1, 2
SV	B103A	B115	EDITING B103A	5	50	100	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	2.7	0.6	2.0	1, 2
SV	B105	B105A	VOICE PROD B105	5	400	1050	10	10Ø	14 x 12	.05	20	50	85	160	120	0.8	15.2	0.6	2.0	1, 2
SV	B107	B101	OFFICE B107, B102 & STOR B101B	5	150	300	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	5.7	0.6	2.0	1, 2
SV	B112	B112	GRAPHICS/COMM/DIGITAL DESIGN B112	5	800	1800	14	14Ø	20 x 18	.08	20	50	85	160	120	1.5	30.3	0.6	2.0	1, 2
SV	B112A	B112A	PRINT RM B112A	5	200	500	8	8Ø	12 x 10	.04	20	50	85	160	120	0.5	7.6	0.6	2.0	1, 2
SV	B113	B115	OFFICE B113 & SSTOR B115	5	100	200	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	B114	B115	LIGHTING STUDIO B114	5	100	200	6	6Ø	10 x10	.08	22	50	85	160	120	0.5	3.8	0.6	2.0	1, 2
SV	B143A	B143A	CLASSROOM B143A	5	450	1200	12	12Ø	18 x 15	.05	20	50	90	160	120	1.0	19.5	0.6	2.0	1, 2
SV	B143B	B143B	CLASSROOM B134B	5	450	1200	12	12Ø	18 x 15	.05	20	50	90	160	120	1.0	19.5	0.6	2.0	1, 2
SV	B203	B211	LL STUD ASST. B202, OFF. B203, LL ENG. B201	5	300	450	8	8Ø	12 x 10	.04	20	50	85	160	120	0.6	11.4	0.6	2.0	1, 2
SV	B204	B204	LL CONF B204	5	150	300	6	6Ø	10 x10	.08	22	50		160	120	0.5	5.7	0.6	2.0	1, 2
SV	B210	B210	AUTISM COMM B210	5	160	400	6	6Ø	10 x10	.08	22	50		160	120	0.5	5.9	0.6	2.0	1, 2
SV	B211	B211	CAREER EXP B211	5	160	400	6	6Ø	10 x10	.08	22	50		160	120	0.5	5.9	0.6	2.0	1, 2
SV	B212	B212	GROSS M	5	210	520	8	8Ø	12 x 10	.04	20	50		160	120	0.5	7.6	0.6	2.0	1, 2
SV	B214	B214	DEV. INSTRUCTION	5	350	800	10	10Ø	14 x 12	.05	20	50		160	120	0.7	13.3	0.6	2.0	1, 2
SV	B215	B215B	LS APARTMENT B215	5	240	600	10	10Ø	14 x 12	.05	20	50		160	120	0.6	10.6	0.6	2.0	1, 2
SV	B216	B210	SPEECH THERAPY	5	100	200	6	6Ø	10 x10	.08	22	50		160	120	0.5	3.8	0.6	2.0	1, 2
SV	D105B	D105B	NURSE COMMON AREA D105B	7	300	835	10	10Ø	14 x 12	.05	20	50		160	120	0.6	11.4	0.6	2.0	1, 2
SV	D106	D107	CONSULT/DR OFFICE D106	7	100	150	6	6Ø	10 x10	.08	22	50		160	120	0.5	3.8	0.6	2.0	1, 2
SV	D111	D111	OFFICE D111	7	150	250	6	6Ø	10 x10	.08	22	50		160	120	0.5	5.7	0.6	2.0	1, 2
SV	D123A	D123A	CULINARY ARTS D123A	8	1200	1200	12	12Ø	18 x 15	.05	20	50		160	120	2.3	45.4	0.6	2.0	1, 2 NOTE: SV-D123A - LOW EVENT MIN 400CFM
SV	D123a	D123	BAKE LAB D123	8	1400	1400	12	12Ø	18 x 15	.05	20	50		160	120	2.7	52.9	0.6	2.0	1, 2 NOTE: SV-D123b - LOW EVENT MIN 450CFM
SV	D123b	D123	BAKE LAB D123	8	1050	1050	10	10Ø	14 x 12	.05	20	50		160	120	2.0	39.7	0.6	2.0	1, 2 NOTE: SV-D123a - LOW EVENT MIN 350CFM
SV	D123E	D123A	CULINARY ARTS D123A	8	1400	1400	12	12Ø	18 x 15	.05	20	50		160	120	2.7	52.9	0.6	2.0	1, 2 NOTE: SV-D123E - LOW EVENT MIN 450CFM
SV	D123F	D123F	WARE WASH D123F	8	1200	1200	12	12Ø	18 x 15	.05	20	50		160	120	2.3	45.4	0.6	2.0	1, 2 NOTE: SV-D123F - LOW EVENT MIN 400CFM
SV	D125	D123A	OFFICE D123, LOCKER D127 & D129	8	100	150	6	6Ø	10 x10	.08	22	50		160	120	0.5	3.8	0.6	2.0	1, 2
SV	D151	D123A	DINING D151	8	2000	2000	14	14Ø	20 x 18	.08	20	50		160	120	3.8	75.6	0.6	2.0	1, 2 NOTE: SV-D151 - LOW EVENT MIN 600CFM
SV	D151A	D151A	SALE D151A	8	1000	1000	10	10Ø	14 x 12	.05	20	50		160	120	1.9	37.8	0.6	2.0	1, 2 NOTE: SV-D151A - LOW EVENT MIN 600CFM
SV	D210	D210	PRINT LAB D210	7	175	425	8	8Ø	12 x 10	.04	20	50		160	120	0.5	6.8	0.6	2.0	1, 2
SV	D211	D211	OFF D211, WK OFFICE A2116 & A211E	7	250	450	8	8Ø	12 x 10	.04	20	50		160	120	0.5	9.5	0.6	2.0	1, 2
SV	D212	D212	CPU SYSTEMS D212		500	1200	12	12Ø	18 x 15	.05	20	50		160	120	1.0	19.0	0.6	2.0	1, 2
SV	D212A	D212A	6 SERVER INST. D212A	7	100	210	6	6Ø	10 x10	.08	22	50		160	120	0.5	3.8	0.6	2.0	1, 2
SV	D214	D214	OFFICE 214		75	125	6	6Ø	10 x10	.08	22	50		160	120	0.5	3.3	0.6	2.0	1, 2

1. SELECTION BASED ON ENVIRO-TEC.
2. MIN. SP IS THE PRESSURE DIFFERENCE BETWEEN THE TERMINAL INLET AND DISCHARGE WITH THE DAMPER OPEN.

MECHANICAL RADIANT PANEL SCHEDULE - RP

TAG	NUMBER	TUBE SIZE	# TUBES	TUBE TYPE	PANEL WIDTH	TYPE	AVERAGE HOT WATER TEMP (F)	CAPACITY BTUH/LF	REMARKS
RP1	1	1/2"	4	COPPER	24"	EXTRUDED ALUMINUM	145	265	1, 2, 3, 4, 5, MODEL AR-X EXTRUDED PANEL

1. SELECTION BASED ON AIRTITE OR EQUIVELANT BY AEROTECH.
2. PROVIDE MANUFACTURER'S TRIM PIECES AS REQUIRED, AND INSTALL RADIANT PANELS AS RECOMMENDED BY MANUFACTURER.
3. REFER TO EQUIPMENT INSULATION SPECIFICATION FOR INSULATION MATERIAL ABOVE PANEL (1 1/2" FIBERGLASS DUCT LINER).
4. COORDINATE MOUNTING TYPES WITH ARCHITECTURAL CEILING PLANS. PROVIDE SURFACE MOUNTED UNITS WHERE APPLICABLE.
5. LENGTHS INDICATED ARE NOMINAL. FIELD VERIFY FIT PRIOR TO RELEASE.

6

MECHANICAL FINTUBE RADIATION SCHEDULE - FT

TAG	NUMBER	ELEMENT TUBE SIZE	TUBE TYPE	ROWS	FIN SIZE	FIN TYPE	ENCLOSURE TYPE	SIZE	MTG HGT (BOTTOM)	AVERAGE HOT WATER TEMP (F)	CAPACITY BTUH/LF	REMARKS
FT1		3/4"	COPPER	1	4-1/4" x 3-5/8"	ALUMINUM	SLOPE TOP	5-1/4" x 14"H	4"	145	780	1, MODEL LVS VC3/4-435
FT2		1"	COPPER	1	4-1/4"x4-1/4"	ALUMINUM	TROUGH	9" X 9-1/2"H	-6"	145	660	1, MODEL TR - TROUGH
FT3		1"	COPPER	1	4-1/4"x4-1/4"	ALUMINUM	"LVX" EXPANDED METAL	5" x 6"H	6"	145	725	1, MODEL LVX VC45

1. SELECTION BASED ON VULCAN.

LAVALLEE BRENSINGER ARCHITECTS
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www.rfsengineering.com
RFS Project #: 7300.001

STATE OF MAINE CHRISTOPHER M. SHUMWAY No. 10820 LICENSED PROFESSIONAL ENGINEER

Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23

N

FOR ADDITIONAL INFORMATION, REFER TO PROJECT MANUAL.

CONTENT:
MECHANICAL SCHEDULES

DRAWN BY: S.DANBY
PROJECT NO: 12-067-00
DATE: 02/11/2016
REVISED:
SCALE:

M5.03

Project Phase
BID DOCUMENTS

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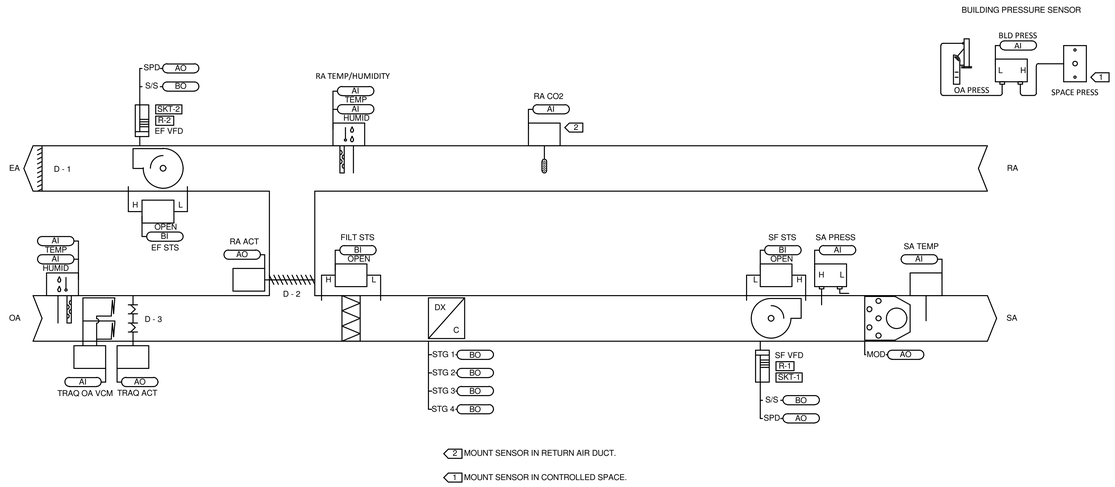
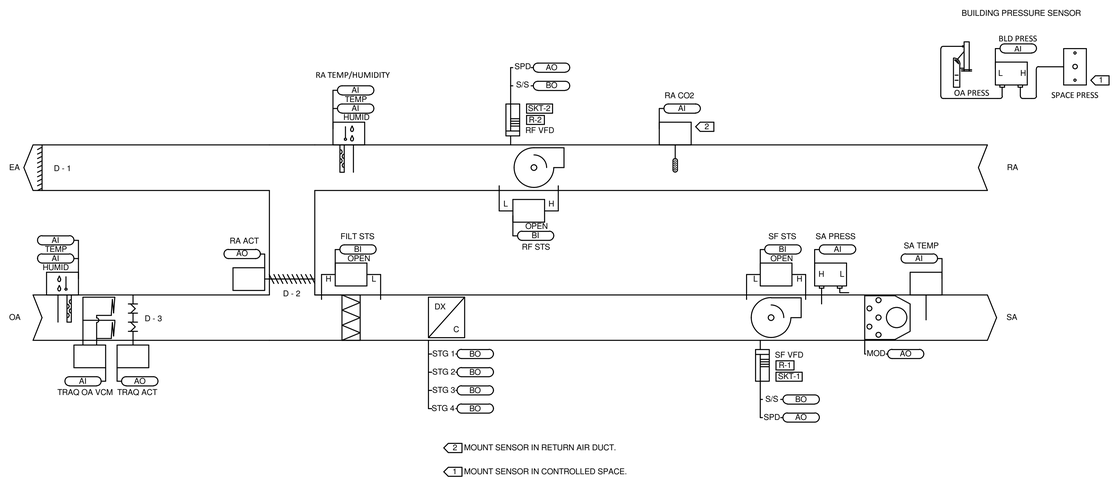
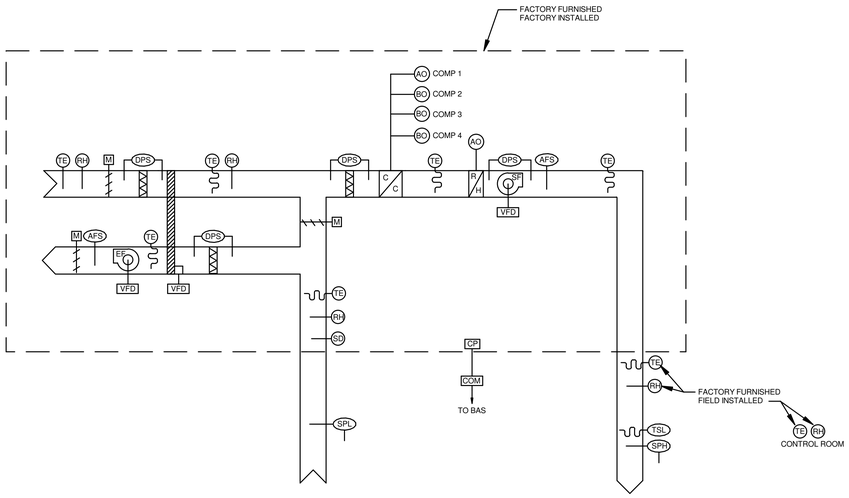


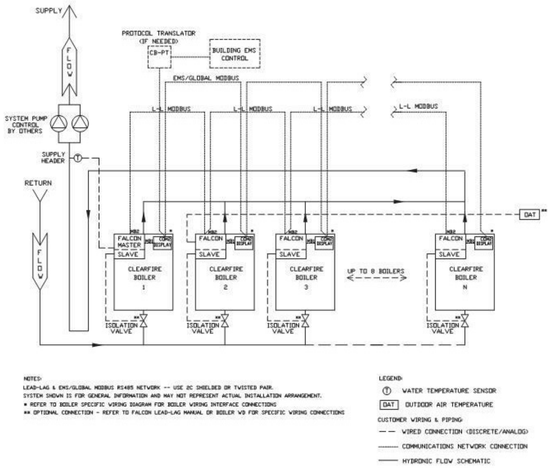
AHU SYSTEM CONTROL DIAGRAM (1, 2, 3, 4, & 6)



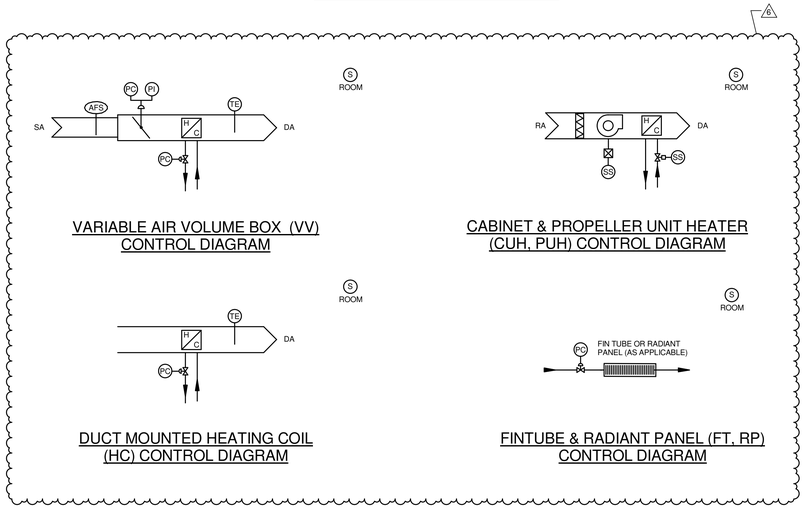
AHU SYSTEM CONTROL DIAGRAM (5, 7, 8, & 9)



DEHUMIDIFICATION ROOFTOP UNIT CONTROL DIAGRAM (DHU-1 THRU 12)



BOILER CONTROLS SCHEMATIC



VARIABLE AIR VOLUME BOX (VV) CONTROL DIAGRAM

CABINET & PROPELLER UNIT HEATER (CUH, PUH) CONTROL DIAGRAM

DUCT MOUNTED HEATING COIL (HC) CONTROL DIAGRAM

FINTUBE & RADIANT PANEL (FT, RP) CONTROL DIAGRAM

BUILDING AUTOMATION SYSTEM LEGEND

- FAN
- PARALLEL BLADE DAMPER WITH MODULATING ELECTRIC ACTUATOR
- PARALLEL BLADE DAMPER WITH TWO-POSITION ELECTRIC ACTUATOR WITH END SWITCH
- OPPOSED BLADE DAMPER WITH MODULATING ELECTRIC ACTUATOR
- OPPOSED BLADE DAMPER WITH TWO-POSITION ELECTRIC ACTUATOR WITH END SWITCH
- SINGLE BLADE CONTROL DAMPER
- FSD — FIRE SMOKE DAMPER WITH OPEN/CLOSE INDICATION
- TWO-WAY CONTROL VALVE WITH MODULATING ELECTRIC ACTUATOR
- TWO-WAY CONTROL VALVE WITH TWO-POSITION ELECTRIC ACTUATOR WITH END SWITCH
- THREE-WAY CONTROL VALVE WITH MODULATING ELECTRIC ACTUATOR
- THREE-WAY CONTROL VALVE WITH TWO-POSITION ELECTRIC ACTUATOR WITH END SWITCH
- FILTER
- HEATING COIL
- COOLING COIL
- REHEAT COIL
- SENSOR/TRANSMITTER WITH AVERAGING ELEMENT
- SENSOR/TRANSMITTER WITH PROBE ELEMENT AND IMMERSION WELL FOR PIPING AS APPLICABLE
- DDC MONITORING/CONTROL HARDWARE AND WIRING BY BAS CONTRACTOR UNLESS OTHERWISE NOTED
- LOCAL MONITORING/CONTROL HARDWARE AND WIRING BY BAS CONTRACTOR UNLESS OTHERWISE NOTED
- MONITORING/CONTROL HARDWARE BY OTHER TRADES AND WIRING BY BAS CONTRACTOR UNLESS OTHERWISE NOTED
- BAS — CONTROL PANEL BY BAS CONTRACTOR
- COM — COMMUNICATION INTERFACE AND WIRING BY BAS CONTRACTOR
- CP — CONTROL PANEL BY EQUIPMENT MANUFACTURER
- VFD — VARIABLE FREQUENCY DRIVE
- MOTOR STARTER

BUILDING AUTOMATION SYSTEM ABBREVIATIONS

AI	ANALOG INPUT
ALM	ALARM/FAULT
AMP	AMPERAGE (ANALOG INPUT)
AFS	AIRFLOW MEASUREMENT STATION
AO	ANALOG OUTPUT
BAS	BUILDING AUTOMATION SYSTEM
BI	BINARY INPUT
BO	BINARY OUTPUT
CM	CONTROL MODULE (FIRE ALARM SYSTEM)
CO	CARBON MONOXIDE TRANSMITTER
CO2	CARBON DIOXIDE TRANSMITTER
COM	COMMUNICATION INTERFACE
CS	CURRENT SWITCH WITH ADJUSTABLE TRIP
CT	CURRENT TRANSDUCER (TRANSMITTER)
DA	DISCHARGE AIR
DEW	DEWPOINT TRANSMITTER
DPS	DIFFERENTIAL PRESSURE SWITCH WITH ADJUSTABLE TRIP AND MANUAL RESET
DPT	DIFFERENTIAL PRESSURE TRANSDUCER (TRANSMITTER)
EA	EXHAUST AIR
ES	END SWITCH
FAS	FIRE ALARM SYSTEM
FS	FLOW SWITCH WITH ADJUSTABLE TRIP
LDS	LEAK DETECTION SWITCH
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OUTSIDE AIR
OCC	OCCUPANCY SENSOR
PC	POSITION CONTROL (ANALOG OUTPUT)
PI	POSITION INDICATION (ANALOG INPUT)
PUP	PICKUP PORT (PRESSURE)
RA	RETURN AIR
REF	REFRIGERANT DETECTOR
RF	RETURN FAN
RH	RELATIVE HUMIDITY TRANSMITTER
RLY	RELAY
RS	RUN STATUS (BINARY INPUT)
S	ROOM TEMPERATURE SENSOR
SA	SUPPLY AIR
SD	SMOKE DETECTOR
SF	SUPPLY FAN
SPC	SPEED CONTROL (ANALOG OUTPUT)
SPI	SPEED INDICATION (ANALOG INPUT)
SPT	STATIC PRESSURE TRANSDUCER (TRANSMITTER)
SPH	STATIC PRESSURE HIGH SWITCH WITH ADJUSTABLE TRIP AND MANUAL RESET
SPL	STATIC PRESSURE LOW SWITCH WITH ADJUSTABLE TRIP AND MANUAL RESET
SS	START/STOP (BINARY OUTPUT)
SUN	SUN SHIELD
T	THERMOSTAT
TE	TEMPERATURE ELEMENT (SENSOR)
TSH	TEMPERATURE SWITCH HIGH WITH ADJUSTABLE TRIP AND MANUAL RESET
TSL	TEMPERATURE SWITCH LOW WITH ADJUSTABLE TRIP AND MANUAL RESET
VFD	VARIABLE FREQUENCY DRIVE
WFS	WATERFLOW MEASUREMENT STATION

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STATE OF MAINE — CHRISTOPHER M. BRAMKAY — LICENSED — PROFESSIONAL ENGINEER

Sanford School Department and State of Maine Department of Education

SANFORD HIGH SCHOOL and TECHNICAL CENTER

SANFORD, ME 04073

NO.	DESCRIPTION	DATE
6	ADDENDUM #6	2016-03-23

CONTENT: MECHANICAL CONTROLS

DRAWN BY:	S. DANBY
PROJECT NO:	12-067-00
DATE:	02/11/2016
REVISED:	
SCALE:	AS NOTED

M6.01

Project Phase: **BID DOCUMENTS**

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SECTION 23 73 00

VARIABLE REFRIGERANT FLOW SYSTEMS

(Mechanical Trade Bid Required)

PART 1 – GENERAL

1.01 SUMMARY

A. The HVAC basis of design shall be Trane 4TVH Variable Refrigerant Flow (VRF) System as scheduled.

B. Bidders shall provide the minimum system as indicated on drawing, including Heat Pump systems as defined by model and family numbers. All systems shall be capable of providing the scheduled capacity at the location of the indoor unit regardless of pipe length. Nominal or catalog capacities will not be accepted.

C. The Heat Pump system shall consist of Trane 4TVH Air Source units, multiple Trane indoor units, and Trane VRF System Controls.

D. Building Automation System (BAS) controls, installation, and integration shall be provided by the manufacturer of the VRF system. This is to ensure sole source responsibility for the BAS control system.

1.02 QUALITY ASSURANCE

A. System efficiencies (SEER and HSPF) for units less than 65,000 BTUH shall be certified by AHRI standard 210-240, and shall be published for public review at www.ahrinet.org. Equipment that is "rated" in accordance with AHRI Standard 210-240, but not published for public review by AHRI shall not be accepted.

B. System efficiencies (IEER and SCHE) for units greater than 65,000 BTUH shall be certified by AHRI standard 1230, and shall be published for public review at www.ahrinet.org. Equipment that is "rated" in accordance with AHRI Standard 1230, but not published for public review by AHRI shall not be accepted.

C. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

D. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

E. Project shall comply with the applicable version of ASHRAE standard 15.

F. Project shall comply with the applicable version of ASHRAE 90.1

G. The VRF manufacturing facility shall be registered to ISO 9001 and ISO14001.

H. All components shall be provided by one manufacturer including but not limited to:

1. Outdoor Units
2. Indoor Units
3. Mode Control Units
4. All necessary and applicable controls for the VRF System
5. Factory refrigerant charge for outdoor unit(s) only

6. Y and or T-Branch(s) (field fabrication of Y or T branches is not acceptable)
7. Condensate Lift Pump(s) as shown on the contract documents
8. Refrigerant Ball Valves as shown on the contract documents
9. Service Software

1.03 DELIVERY, STORAGE AND HANDLING

A. Installing contractor will take all reasonable and appropriate care to store and handle equipment per the manufacturer's recommendation.

1.04 SUBMITTALS

A. **Submit shop drawings and product data under provisions of Section 23 01 00.**

B. **Product Data: For each type of product. Include rated capacities, operating characteristics, and furnished specialties and accessories.**

C. **Shop Drawings:**

1. **Include plans, elevations, sections, and attachment details.**
2. **Include details of equipment assemblies. Indicate dimensions, weights, loads, clearances, method of field assembly, components, and location and size of each field connection.**
3. **Include diagrams for refrigerant piping, refrigerant components, power, signal, and control wiring.**

D. Installing contractor shall provide the following:

4. Trane VRF Guide Specification
5. Trane VRF Dimensional Data for all products submitted
6. Trane VRF Product Data for all products submitted.
7. Trane VRF Select report showing design conditions, total load profile, and actual capacity at actual Indoor Unit location,
8. Trane VRF Select Piping and Wiring layout showing estimated piping, wiring sizes, equipment quantities, piping length estimate, and additional refrigerant charge.
9. Trane VRF Select Schedule showing the performance for all pieces of equipment.

1.05 INSTALLATION AND OPERATION MANUALS

A. Owner shall be provided with a complete and comprehensive electronic set of Installation and Operation Manuals.

1.06 QUALIFICATIONS

A. Manufacturer shall have a minimum of twenty-five (25) years of HVAC experience in the North America market.

B. Manufacturer to have Local Factory Service within seventy-five (75) miles of jobsite.

C. The VRF system shall be installed by a manufacturer certified installer with extensive VRF installation and service training. The mandatory contractor service and install training shall be performed by the manufacturer.

1.07 WARRANTY

A. The units shall be covered by the manufacturer's standard limited warranty for a period of 12 months from date of installation. If during this period, any part should fail to function properly due

to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

B. The units shall carry an extended manufacturer's functional parts warranty for a period of 10 years from date of installation.

C. The following steps shall be taken by the contractor to ensure systems are eligible for extended warranty.

1. System is designed and submitted using the approved application tool.
2. System installed by a contractor who has successfully completed the manufacturer factory training class.
3. Upon completion of installation and prior to final commissioning, contractor shall provide revised piping layout reflecting actual installation conditions to manufacturer VRF technician for submittal to Factory Service Department.
4. Provide a verified and submitted commissioning report to Factory Service Department.

D. The contractor shall provide labor warranty as specified in the general conditions for this project.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide basis-of-design product or comparable substitute product as listed below.

1. Basis-of-Design Product
a. Trane

2. Substitute Product
b. Mitsubishi
c. Daikin
d. Johnson Controls, York

B. Substitute Product: Substitute product acceptable only if in compliance with requirements. Bidding contractor shall be responsible for electrical, mechanical and structural modifications required when using substitute product. It shall be the responsibility of the bidding contractor to make the Engineer aware of any required modifications.

~~C. Basis of design shall be: Trane VRF~~

~~D. The following manufacturers shall be allowed to bid as a deductive alternate provided they meet the scheduled performance indicated on the drawings:~~

~~3. Mitsubishi~~
~~4. Daikin~~

2.02 HEAT PUMP AIR SOURCE UNITS

A. The Trane 4TVH VRF Heat Pump Air Source unit shall be specifically used with Trane VRF Heat Pump components. The unit electrical power shall be 208/230 volts or 460 volts, 3 phase, 60 hertz as specified. Units shall have weather tight construction for outdoor installation, (outdoor unit).

B. The Trane Heat Pump outdoor unit shall be equipped with multiple circuit boards. These boards shall perform all functions necessary for operation. The outdoor unit shall be completely factory assembled, internally piped and wired. Each unit shall be run tested.

5. The combination ratio of the nominal indoor cooling capacity versus the nominal outdoor rated cooling capacity shall range from 50% to 130%.
6. Outdoor unit shall have a sound rating no higher than 62/83(Pressure/Power) dB(A).
7. Unit shall have a night quiet setting to reduce nighttime sound levels.
8. All refrigerant lines from the outdoor unit to IDUs (Indoor Units) shall be field insulated with a minimum insulation as referenced in the Trane VRF IOM (VRF-SVN034A-EN) Table 27, "Pipe insulation selector."
9. The outdoor unit shall have an accumulator.
10. The outdoor unit shall have a high pressure safety switch, fuse, over-current protection and crank case heater.
11. If the outdoor unit is above the indoor unit, the outdoor unit shall have the ability to operate with a maximum height difference of 164ft. If the indoor unit requirement is greater than 164 ft, contact your local Trane Sales Office.
12. If the outdoor unit is below the indoor unit, the outdoor unit shall have the ability to operate with a maximum height difference of 131 ft.
13. The system shall have a maximum total refrigerant tubing length of 3281ft.
14. The maximum length between outdoor unit and the furthest indoor units is not to exceed 656 ft (722 equivalent feet).
15. The maximum height difference between indoor units shall be 164 ft.
16. The outdoor unit shall be capable of operating in cooling mode from 23°F to 120°F.
17. The outdoor unit shall be capable of operating in heating mode from 75°F to -13°F ambient temperatures without additional low ambient controls, additional modules, or low ambient accessories.
18. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
19. The outdoor units shall provide continuous heating during oil return and the defrost cycle through the use of rotational defrost. (multiple module systems)
20. Units shall have a snow blower feature to ensure the dispersion of accumulated snow

C. The unit casing(s) shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

D. The outdoor unit condenser fans shall be furnished with direct drive, variable speed motor(s). All fan motors shall have inherent motor protection, have permanently lubricated bearings. All fan motors shall be mounted for quiet operation. All fans shall be provided with a raised guard to prevent contact with moving parts. The outdoor unit shall have vertical discharge airflow.

E. R410A refrigerant shall be required for Trane VRF outdoor unit systems. Manufacturer shall only provide the refrigerant as required for unit charge. Contractor shall be required to provide additional refrigerant as specified in Trane VRF Select reports.

F. System shall use Polyvinylether (PVE) oil. Due to the increased risk of hydrolysis and formation of acids, Polyolester (POE) oil shall not be acceptable.

G. The outdoor condenser coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing. The condenser coil shall have Blue Fin anti-corrosion protection as a standard feature. The coil shall be protected with an integral metal guard. The coil fins shall be coated with hydrophilic paints.

H. The Trane VRF Heat Pump outdoor units shall be equipped with inverter driven vapor injection asymmetric scroll compressor(s). The asymmetric design will allow for only one point of contact

for the scroll compressor blades resulting in reduced friction, and increased efficiency. Conventional scroll compressors with 2-points of contact will not be allowed due to their inherent inefficiency.

1. The outdoor unit compressor shall utilize inverter driven technology to modulate capacity. The compressors shall also utilize advanced technology adaptive sine wave control for reduced harmonics and faster frequency acceleration.
2. The compressor shall be capable of 1/60th second advanced micro-control.
3. The outdoor unit compressor shall utilize vapor injection technology which shall increase the mass flow rate of refrigerant, resulting in improved performance for low temperature conditions.
4. The compressor will be equipped with an internal thermal overload protection.
5. The compressor shall be mounted to avoid the transmission of vibrations.

I. Use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire for communications wiring. Splicing of communication wiring shall not be permitted.

2.03 SINGLE PHASE HEAT PUMP OUTDOOR UNITS

A. The Trane 4TVH Single Phase Air Source unit shall be specifically used with Trane VRF Heat Pump components. The outdoor unit electrical power shall be 208/230 volts as specified. Units shall have weather tight construction for outdoor installation, (outdoor units).

B. The Trane Single Phase Heat Pump outdoor units shall be equipped with multiple circuit boards. These boards shall perform all functions necessary for operation. The outdoor unit shall be completely factory assembled, internally piped and wired. Each unit shall be run tested.

1. The combination ratio of the nominal indoor cooling capacity versus the nominal outdoor rated cooling capacity shall range from 50% to 130%.
2. Outdoor unit shall have a sound rating no higher than 53/74 (Pressure/Power) dB(A).
3. Unit shall have a night quiet setting to reduce nighttime sound levels.
4. All refrigerant lines from the outdoor unit to IDUs (Indoor Units) shall be field insulated with a minimum insulation as referenced in the Trane VRF IOM (VRF-SVN033A-EN) Table 14, “Pipe insulation selector.”
5. The outdoor unit shall have an accumulator.
6. The outdoor unit shall have a high pressure safety switch, fuse, over-current protection and crank case heater.
7. If the outdoor unit is above the indoor unit, the outdoor unit shall have the ability to operate with a maximum height difference of 164ft.
8. If the outdoor unit is below the indoor unit, the outdoor unit shall have the ability to operate with a maximum height difference of 131 ft.
9. The system shall have a maximum total refrigerant tubing length of 984 ft.
10. The maximum length between outdoor unit and the furthest indoor units is not to exceed 492 ft (574 equivalent feet).
11. The maximum height difference between indoor units shall be 49 ft.
12. The outdoor unit shall be capable of operating in cooling mode from 118°F to 23°F
13. The outdoor unit shall be capable of operating in heating mode from 66 F° to -4°F ambient temperatures without additional low ambient controls.
14. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
15. Units shall have a horizontal snow blower feature to ensure the dispersion of accumulated snow.

C. The unit casing(s) shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

D. The outdoor unit condenser fans shall be furnished with direct drive, variable speed motor(s). All fan motors shall have inherent motor protection, have permanently lubricated bearings. All fan motors shall be mounted for quiet operation. All fans shall be provided with a raised guard to prevent contact with moving parts. The outdoor unit shall have horizontal discharge airflow.

E. R410A refrigerant shall be required for Trane VRF outdoor unit systems. Manufacturer shall only provide the refrigerant as required for unit charge. Contractor shall be required to provide additional refrigerant as specified in Trane VRF Select reports.

F. System shall use Polyvinylether (PVE) oil. Due to the increased risk of hydrolysis and formation of acids, Polyolester (POE) oil shall not be acceptable.

G. The outdoor condenser coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing. The condenser coil shall have Blue Fin anti-corrosion protection as a standard feature. The coil shall be protected with an integral metal guard. The coil fins shall be coated with hydrophilic paints.

H. The Trane Single Phase Heat Pump outdoor units shall be equipped with modulating rotary compressor(s).

1. The outdoor unit compressor shall utilize inverter driven technology to modulate capacity.
2. Units shall have crankcase heaters.
3. The compressor will be equipped with an internal thermal overload protection.
4. The compressor shall be mounted to avoid the transmission of vibrations.

I. Use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire for communications wiring. Splicing of communication wiring shall not be permitted.

2.04 4-WAY MINI/ 4-WAY CEILING CASSETTE INDOOR UNITS

A. The Trane 4TVB/4TVC are four-way cassette style indoor units that recess into the ceiling grid with an exposed ceiling grille and an integral 2000 step modulating expansion device. The unit electrical power shall be 208-230 volts, 1-phase, 60 hertz.

B. The indoor unit shall be a factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, the electronic modulating linear expansion device, control circuit board, and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function.

C. The unit cabinet shall be a space-saving ceiling-recessed cassette. The cabinet panel shall have provisions for a field installed filtered outside air intake. Branch ducting shall be allowed from cabinet.

D. The indoor fan shall consist of a turbo fan with a single direct drive motor. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings. The indoor fan shall have high, medium, and low fan speeds. The fan speed shall be adjustable by an optional remote controller. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution. If require the cassette shall be capable of closing off one or more vanes to prevent “stray airflow”.

E. Return air shall be filtered by means of a long-life washable permanent filter.

F. The indoor coil shall be constructed as follows:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The coil fins shall be coated with hydrophilic paints.
7. The factory installed condensate lift mechanism shall be able to raise drain water 29.5 inches water column above the condensate pan.
8. Both refrigerant lines to the indoor units shall be insulated.

G. Use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire for communications wiring. Splicing of communication wiring shall not be permitted.

H. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 3 of this guide specification for details on controllers and other control options.

2.05 REQUIRED ACCESSORIES

A. Y-Joint Kits- are a required component for Trane VRF-Systems with multiple evaporators and MCU's on the same system. Y-joints shall be provided for liquid, suction, and hot gas fittings as required. Y-joints shall be provided with polystyrene insulation. Y-branches shall facilitate different pipe sizes without having to braze additional fittings. Field fabrication or substitution of non-Trane Y-Joints shall void warranty. Kits shall be installed per manufacturer guidelines. Requires field installation.

B. T-Joint Kits – are a required component for Trane VRF systems with multiple outdoor modules on a single system. The T-Joint shall be provided for liquid, suction, and hot gas fittings as required. T-Joints shall be provided with polystyrene insulation. T-Branches shall facilitate different pipe sizes without having to braze additional fittings. Field fabrication or substitution of non-Trane T-joints shall void warranty. Kits shall be installed per manufacturer guidelines. Requires field installation.

C. EEV KITs- the EEV (Electronic Expansion Valve) provides refrigerant management of indoor units. The EEV shall be required for field installation on ceiling suspended (floor) indoor units. Heat Recovery systems shall require the single room EEV. Heat Pump systems (only) may also utilize the two or three room EEV kits. Kits shall be installed per manufacturer guidelines. Requires field installation.

D. Condensate Drain Pumps shall be provided for field installation as required for efficient condensate management. Condensate pumps shall be capable of 29.5" of lift to allow condensate to reach the closest gravity drain line. Condensate pumps shall include a check valve to prevent water form flowing back into the indoor unit. Pump shall be mounted in the chassis of the indoor unit. Pump shall draw on required power from the associated indoor unit. Requires field installation (Standard factory installed for all ceiling cassettes).

E. Refrigerant Isolation Ball Valves - shall be provided for field installation as specified by the contract documents. Valves shall utilize a uni-body full port design to minimize leaks and internal pressure drops. Valves shall be rated for 700PSIG, and are offered with an optional factory insulation package. Valves shall be factory tested under pressure. Valves shall require polytetrafluroethylene (PTFE) seals and gaskets. No synthetic O-rings are allowed. Design shall permit valve operation without removal of seal cap. Valves shall have a temperature operation range of -40°F to 300°F. Requires field installation.

F. Simple wired remote controller can be used with all Trane VRF Indoor Units. Remote shall utilize a Multi-function LCD display and shall possesses the following functionality:

1. ON/OFF Control
2. Mode Selection
3. Temperature Set-point
4. Fan Speed Setting
5. ON/OFF Timer
6. Controls up to 16 Indoor Units
7. Up to 2 can be averaged as single controller
8. Child Lock
9. Dirty Filter Alert

G. Standard Cassette Panels shall be required with as indicated for all 1-way, Mini 4-way, and 4-way ceiling cassettes.

H. Wind/Snow Prevention Duct Kit are for vertical air source units. The kits are used in windy or snowy regions to prevent cold gusts of air from interfering with stable operation of the units. They are also for use in snowy regions to prevent snow from accumulating on the units. The kit is recommended when low ambient heating is required. The Wind/Snow prevention kit may require the additional use of the Duct Discharge Kit. Requires field installation.

PART 3 – CONTROLS

3.01 BAS MANUFACTURER

A. The Trane VRF System Network Controls shall be capable of supporting remote controllers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet®.

3.02 ELECTRICAL CHARACTERISTICS

A. The Trane VRF System Network Controls shall operate at 12VDC. Controller power and communications shall be via a common non-polar communications bus.

B. Control wiring shall be installed in a system daisy chain configuration from the wired remote controller to the indoor unit, to the and to outdoor unit. Control wiring to wired remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

C. Control wiring for system controllers, and centralized controllers shall be installed in a daisy chain configuration from interface module to interface module, to system controllers, to the power supply.

D. For communication wiring between ODUs, IDUs, MCU, system controller, and remote controllers use 18 AWG, 25pF/ft nom., 60.7 Ω impedance, braid or foil shielded, twisted pair wire. Splicing of communication wiring shall not be permitted.

E. The Trane VRF SC Web UI shall be capable of being networked with the VRF System Controller TVCTRLTIMD00A0, system controllers for web based control.

F. Network wiring shall be CAT-5e with RJ-45 connection.

3.03 VRF-SYSTEM CONTROLLER+BACnet®

A. The VRF System Controller+BACnet is an intelligent field panel that communicates with VRF Outdoor Unit(s), Indoor Unit(s) and other Trane VRF controllers. Additionally, it shall include a BACnet® IP (Internet Protocol) port to function as a communications gateway to other BACnet IP devices, such as Trane's Tracer SC. The VRF System Controller+BACnet shall connect to

associated indoor and outdoor units utilizing a dedicated control network. The controller utilizes the local area network (LAN) to provide a web page-based user interface available wherever the building's network access is available. The VRF System Controller+BACnet is housed in a protective enclosure suitable for wall-mounting in a mechanical or electrical equipment room. The Trane VRF BACnet® Gateway shall be capable of controlling up to 256 indoor units/EEVs support.

B. The VRF System Controller shall allow a building operator to view the system using a PC with a standard web browser, such as Windows® Internet Explorer or Mozilla Firefox.

C. The VRF System Controller shall include a user interface that includes control and monitoring of each Indoor unit through a standard graphical display with convenient pop-up controller screen to adjust comfort settings for each zone.

D. The VRF SC shall be capable of controlling a maximum of 256 indoor units via a PC. A field supplied PC shall be required. The VRF SC shall support operation superseding that of the remote controllers, system configuration, 1-day/daily/weekly scheduling, monitoring of operation status, error email notification, online maintenance tool and malfunction monitoring.

E. The VRF SC shall have a basic set of operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 256 indoor units), or all indoor units (collective batch operation).

F. The basic set of operation controls for the VRF SC shall include on/off, operation mode selection (auto, cool, heat, dry, and fan), temperature setting, fan speed setting, airflow direction setting, error email notification, and online maintenance.

G. Since the VRF SC provides centralized control, it shall be able to enable or disable operation of local remote controllers via the PC. In terms of scheduling, the VRF SC shall allow the user to define 1-day, daily, and annual schedules with operations consisting of ON/OFF, mode selection, temperature setting, permit/prohibit of wireless/wired remote controllers.

H. The system shall detect and store alarms in the Alarm Log. The Alarm Log shall display critical data about the alarm, including the location of the device, and the time of occurrence. Alarms shall be routed by e-mail to stationary or mobile devices. Capacity to store up to 1024 alarm events on time specific basis shall be required.

I. Database changes made by other users shall automatically be reflected in the VRF System Controller without the need for a central server. The system database be capable of archiving or backing up data for local or offsite storage. This is desirable in the event the date is ever needed for restoring the system. A built-in SD card slot provides for on-board but removable data backup storage.

J. A password shall protect the VRF control system from unauthorized access. Each operator is assigned a role. Roles are defined by access rights. Pre-defined roles shall be selected from the VRF System Controller interface. Operators shall have access only to those features which define their roles. Roles may also be customized. An operator with administrative-level security shall access all information on the system, and shall have the ability to alter passwords and create new security roles.

Trane VRF System Controller+BACnet®

Item	Description	Operation	Display
ON/OFF	Start stop operation for a single group	Each	Each

Trane VRF System Controller+BACnet®

Item	Description	Operation	Display
		Group	Group
Operation Mode	Changes mode between Auto/Cool/Dry/Fan/Heat	Each Group	Each Group
Temperature Setting	Sets the temperature for a single group. Range of temperature settings: Auto/Cool/Dry: 64°F-86°F (18°C-30°C), Heat: 61°F-86°F (16°C-30°C)	Each Group	Each Group
Fan Speed Setting	Models with 3 air flow settings: High/Mid/Low	Each Group	Each Group
Air Flow Direction Setting	Air flow 2-step direction (Swing/Stop). Direct settings at a specific angle. Air flow operation varies depending on the model.	Each Group	Each Group
Web Server Function	Remote control with the public IP address. No management software required – PC-independent management	Each Group	Each Group
Accessible level/ Dynamic user security Management	Wireless/wired remote controller restriction setting Specifies the scope of control and monitoring unit on a per-user 3 accessible levels -Admin/Manager/User	Each Group	Each Group
Error	When an error is occurs on an outdoor unit, the affected unit and error code are displayed	Each Group	Each Group
Schedule Operation	Up to 256 schedule settings including weekly and daily schedule setting	Each Group	Each Group
External Contact Interface	Full indoor unit control with simple contact input (Emergency/Lock) State output (Operation/Error) for synchronous control. 6 digital outputs / 8 digital inputs	Each Channel	Each Channel
Smart Central Management	Control & monitoring zone edition. Wireless/wired remote control restriction. Temperature limit setting Operation mode restriction. Silent control setting	Each Group	Each Group
User editable control logic	User can edit control logic with arithmetic/conditional operators and parameters. Efficient energy saving realization based on various operation conditions.	Each Group	Each Group
Data backup/ Useful history management	Important data is safely stored in SD memory card Record the operation history and error history	Each Group	Each Group
Multi language	English, Korean, Chinese, Spanish, Italian, Portuguese, Dutch, Hungarian, Polish, Russian		

Indoor Unit BACnet® Point List

Instance Number	Object	Object Type	Object Name	Unit Inactive Text-1	Text-2	Text-3	Text-4	Text-5
1	Indoor Temperature	AI	AC Room Temp	°C				
2	Set Temperature	AV	AC Temp Set	°C				

Indoor Unit BACnet® Point List

3	Setting lower temperature limit	AV	AC Cool Limit Temp	°C				
4	Setting upper temperature limit	AV	AC Heat Limit Temp	°C				
5	IDU power usage after the basic date	AI	AC Baseline kWh	kWh				
6	IDU hour usage after the basic date	AI	AC Baseline Minute	Minute				
7	Power value within period	AI	AC Period KWh	kWh				
8	IDU hour usage within period	AI	AC Period Minute	Minute				
9	Power On/Off	BV	AC Power	Off	On			
10	Applying lower temperature limit setting	BV	AC Cool Limit set	False	True			
11	Applying upper limit temperature setting	BV	AC Heat Limit set	False	True			
12	Filter sign status	BI	AC Filter Sign	False	True			
13	Filter sign reset	BO	AC Filter Sign Reset	False	True			
14	Operation mode status	MV	AC Operation Mode	Auto	Cool	Heat	Fan	Dry
15	Fan speed status	MV	AC Fan Speed	Auto	Low	Mid	High	
16	Airflow direction status	MV	AC Fan Flow	None	Vertic al	Horizon	All	
17	Operatiom mode limit status	MV	AC Mode Limit	No Limit	Cool Only	Heat Only		
18	Remote controller limit status	MV	AC Remocon	Enable RC	Disabl e RC	Conditio nal RC		
19	Integrated error code of both indoor unit and outdoor unit	AI	AC Error Code	Refer to List of Error Codes				
20	SPI setting	BV	AC SPI	False	True			
21	Human Sensor setting	BV	AC MDS	False	True			

Indoor Unit BACnet® Point List				
22	AC Indoor Notify	NC	AC Notify	When the error occurred, send event to list of destination in the recipient list. (Max:8)

Outdoor Unit BACnet® Point List								
Instance Number	**Object**	**Object Type**	**Object Name**	**Unit Inactive Text-1**	**Text-2**	**Text-3**	**Text-4**	**Text-5**
1	Outside Temperature	AI	ODU Outside Temp	°C				
2	Cool capacity compensation	AV	ODU Cool Compen	0:5~7°C/1:7~9°C/2:9~11°C/3:10~12°C/ 3:11~13°C/5:12~14°C/6:13~15°C/ 14:Auto control (from ODU)				
3	Heat capacity compensation	AV	ODU Heat Compen	0:25kg/cm^2/1:26kg/cm^2/ 2:27kg/cm^2/3:28kg/cm^2/ 4:29kg/cm^2/5:30kg/cm^2/ 6:31kg/cm^2/7:32kg/cm^2/ 8:33kg/cm^2/14:Auto control (from ODU)				
4	Setting upper temperature limit	BI	AC Heat Limit Temp	False	True			
5	Compressor Status	AI	ODU Comp Status	Refer to the list of the integrated error codes				
6	Interface module notify	NC	IM Notify	When the error occurred, send event to list of destination in the recipient list. (Max:8)				

3.04 VRF-SYSTEM TOUCHSCREEN CONTROLLER

A. The VRF System Touchscreen shall provide an intuitive, fast and convenient method of centrally operating a Trane VRF system. The VRF System Touchscreen shall communicate with associated VRF components through a dedicated control network. It can control many comfort and energy-saving settings, including temperature, fan speeds, and operating schedules for up to 128 indoor units, and up to 16 outdoor units. The unit shall be housed in an attractive enclosure suitable for wall-mounting in an office, corridor or utility room.

B. The System Touchscreen shall feature a 7” Color Capacitive Touch Screen. The User interface shall display operating equipment icons indicating mode status at a glance. All units within a zone shall be managed with one-button control. Unique zone description icons shall make it easy to recognize a zone.

C. Control shall include but not be limited to the following; On/Off control, temperature set-point, mode settings Auto/Heat/Cool/Auto/Dry/Fan, air-direction adjustment, and local temperature set-point restrictions.

D. The System Touchscreen shall be capable of setting up to up to 10 unique schedules including exception day setting for holidays, and Daylight Saving Time adjustment.

E. The System Touchscreen shall be capable of grouping indoor unit in common zones. There may be up to 12 zones. Zones may be individually named.

F. The System Touchscreen shall provide management of multiple indoor units as 1 unit (Group control). Additionally, the controller shall provide monitoring and control points for Interlocking of external equipment via 2 Binary Inputs and 1 Binary Output.

G. The System Touchscreen shall provide an alarm/error display, and alarm history.

H. Security shall be provided by a secure password.

I. The System Touchscreen shall connect via R1/R2 VRF communications link for monitoring and control of up to 128-total Indoor Units and MCUs, associated with up to 16-outdoor units. Alternately, the system shall connect via F1/F2 VRF communications link for monitoring and control of up to 64-indoor units plus up to 16-MCUs, associated with 1-Outdoor Unit.

PART 4 – EXECUTION

4.01 INSTALLATION

A. System shall be installed in accordance with manufacturer's guidelines.

B. Installing contractor shall attend and successfully complete the Trane VRF Installation factory training class. Contractor shall submit certificate of completion as part of project closeout documents.

C. Installing contractor shall install units to comply with building codes.

D. Trane VRF systems shall be installed in such a way as to permit access for routine maintenance.

4.02 COMMISSIONING

A. Upon completion of installation and prior to final commissioning, contractor shall provide revised piping layout reflecting actual installation conditions to Trane VRF technician.

B. The system shall then be reviewed and commissioned by a Trane Factory VRF Technician. Contractor shall provide a verified and submitted commissioning report to Trane Factory Service Department, and to the owner's agent verifying the system has met the requirements for proper installation, and function.

C. Engage a Trane Factory Certified VRF Technician to train owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

SECTION 23 92 50

INDUSTRIAL COLLECTION SYSTEMS

(Mechanical Trade Bid Required)

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Industrial dust collectors.

B. Air filter fan units.

C. Extraction arms.

D. Vehicle exhaust systems.

E. Spark detection and extinguishing systems.

F. Industrial duct systems and accessories.

G. Industrial fume//heat hoods.

1.02 RELATED DOCUMENTS

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

B. All related Specification sections shall be used in conjunction with this Section.

1.03 REFERENCES

A. Material, construction, and installation shall meet requirements of most recent editions of the following standards and references, except where more stringent requirements are specified or indicated on the Drawings.

1. ACGIH - Industrial Ventilation, A Manual of Recommended Practice.
2. SMACNA - HVAC Duct Construction Standards.
3. SMACNA - Round Industrial Duct Construction Standard.
4. SMACNA - Rectangular Industrial Duct Construction Standard.
5. NFPA 68 and 664.

1.04 DEFINITIONS

A. Duct **and Hood** Sizes: Inside clear dimensions.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 01 00.

B. Submit scaled detailed fabrication drawings for the duct-to-equipment connection and/or exhaust hood for the equipment serviced by the industrial collection systems (i.e., planner, radial arm saw, jointer, table saw, band saw, and disc/belt sander). Duct-to-equipment and exhaust hood construction shall be as recommended in the *ACGIH - Industrial, Ventilation, a Manual of Recommended Practice*, modified as appropriate to suit project specific equipment requirements.

C. Submit scaled detailed fabrication drawings for entire industrial collection systems indicating all duct sizes, fittings, turning radii, access doors, dampers, collection equipment, and all other appurtenances which will be an integral part of the system. The detailed layout of the collection systems shall be according to recommended practices contained in *ACGIH Industrial Ventilation, A Manual of Recommended Practice*, as well as specified herein and as indicated on the Drawings. **All industrial collection systems shall utilize clamp-together duct systems as manufactured by KB Duct or Nordfab.**

D. Provide manufacturers literature and data indicating rated capacities, dimensions, weights and point loadings, accessories, electrical requirements and wiring diagrams, and location and sizes of field connections.

E. Provide fan curves with specified operating point clearly plotted.

F. Submit sound power levels for both fan inlet and outlet at rated capacity.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 23 01 00.

B. Operation Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - INDUSTRIAL DUST COLLECTORS, AIR FILTER FAN UNITS AND EXTRACTION ARMS

A. Airex Industries

B. Airflow Systems

C. Sternvent Company

D. Donaldson Torit

E. United Air Specialists

2.02 DUST COLLECTORS

A. General:

1. Furnish and install where shown on the plans, high efficiency filter type dust collectors with integral blowers sized for design air flow as shown on the mechanical equipment schedules.

B. Control panels shall be either UL or ETL labeled for compliance with UL 508A. Control panels not labeled by dust collector manufacturer shall be labeled, in field, by a certified UL or ETL representative, prior to placing equipment in operation.

C. Discharge noise from blowers shall be attenuated by an external field supported duct silencer fabricated with 4.75 lb. density inorganic mineral or glass fiber. This media shall be protected from erosion by the air flow through the use of galvanized perforated metal with aerodynamic leading and trailing edges to insure maximum acoustical insertion loss at minimum static pressure drop. Lining of the fan scroll, instead of an external silencer, shall not be accepted.

D. Interior and exterior carbon steel surfaces shall be coated with two part epoxy primer and exterior painted with two-part urethane enamel.

E. Dust Collector DC-C117 - (CTE Exploration)

1. 1- Airex dust collection model SCST-64-660

   a. Model SCST dust collectors are mechanical bag units with an electrical shaker. This industrial quality unit utilizes polyester needlefelt bags for filtration and comes in a short hopper model with drum kit standard.
   b. Blower Model SXBD-06 includes housing, AMCA C rating, BI wheel, matching paint, <U> base support, and DIRECT DRIVE TEFC motor. 4 500 CFM @ 12-14" H2O.
   c. 20HP- 460V/3/60

2. Control panels

   a. Electric Shaker full controls includes:

      1) 1HP Shaker motor
      2) 20 HP magnetic motor starter 460V/3/60
      3) Fuses
      4) Fused disconnect with fuses
      5) Star/Stop button
      6) On/Off lamps
      7) Relay's
      8) Transformer 460-3-60
      9) Programmable timer
      10) Up to 6 auxiliary contacts
      11) Drawings
      12) CSA Approved

3. An electronic industrial control panel includes a programmable timer for the (1) HP, 460v, 3ph electric shaker motor, a 20hp magnetic motor starter (260v, 3ph), fuses, a fused disconnect, industrial on/off switches with indicator lamps, relays, transformer at 460v, 3ph, 60hz and up to (6) auxiliary contacts. A full set of electrical drawings are provided. CSA approved.
4. Additional factory installed safety features include: (2) explosion relief doors, rated for the kst value of wood dust, a blow back damper on the collector inlet, a Hansentek AN104 spark detection and suppression system, high speed abort damper and silencer assembly for motor/blower discharge. A fire kit temperature probe and sprinkler pipe only are provided as an additional safety feature.

F. Dust Collector DC-C127 (Building Trades)

1. One (1) Airex dust collector model 100W10

   a. Selection Of Dust Collector :

Bag removal service:	inside
Gas inlet:	side connection
Service:	continuous
Operation:	pull-through
Location:	outside or inside

2. Construction Details:

   a. Casing :

Material:	black steel

Thickness:	reinforced 12 gauges
Design static pressure:	16 inches water gauge
Filter bag access:	inside removal by service door
Gas inlet:	16''Ø side connection with Baffles

b. Tube Sheet :

Type:	flat
Material:	black steel
Thickness:	12 gauges, reinforced
Quantity:	one (1)
Bag spacings:	center to center 7'' x 7''

c. Filter Media:

Style:	Airex
Material:	reinforced felt
Composition:	100 % polyester
Weight:	15.0 – 17.0 oz/sq.ft.
Finish:	heatset
Maximum operating temperature:	200°F – 275°F

d. Venturis:

Type:	Spun
Material:	Steel Spinning

e. Filter Bags Cleaning System :

Type :	Pulse-Jet
C.F.M. required per module:	5-10 c.f.m. based for cleaning cycle 1-2 minutes
Compressed air pressure:	100 p.s.i.g.
Air properties:	clean, dry, without oil

f. Compressed Air Tank:

Quantity:	One (1) per unit
Size:	5'' x 5'', full length of casing
Location:	side-mounted

g. Diaphragm Valves :

Size:	¾''
Manufacturer:	Goyen

h. Solenoid:

Location:	Mounted inside of one casing NEMA 4 beside compressed air tank

i. Filter Bags Controller:

System:	Pulse-Jet
Operation:	Sequence

Control adjustment:	one (1) for pulse timing (adjustable) One (1) for interval between pulse (adjustable)
Wiring:	printed circuit with terminal block
Enclosure:	NEMA 4
Location:	remote

j. Filter Bag Gauge:

Quantity per unit:	one (1) complete with tubing and connections
Type:	Magnehelic
Range:	0-10 water gauge

k. Support:

Type:	Structural
Clearance:	To suit application

l. Painting:

Standard finish:	one (1) primer and two (2) paints
Surface preparation:	brush clean
Type:	Polyurethane – semi lustre
Thickness:	Average 2.3 mils

3. Blower Model SQB-22.25 includes housing, AMCA C rating, BI wheel, OSHA guard, all belts, matching paint, <U> base support, and TEFC motor. Top mounted. 40HP, 460V/3/60; 10 000CFM @ 16'' H2O.
4. Explosion door as per NFPA68
5. Blowback Ø20''
6. Platform, ladder & cage
7. Complete control panel including Nema 12 enclosure, magnetic motor starter, fuses, thermal overload, step down transformer, illuminated on/off buttons, three position selector switch, integrated pulse sequencer controller board, and rotary disconnect. CSA approved. 40HP, 460V/3/60 with Soft Start.
8. Additional safety and convenience features include, a photohelic gauge (saves significant amounts of compressed air), rotary airlock for the collector discharge, fire kit including temperature probe and sprinkler pipe only, connects to existing fire suppression system, a Hansentek AN104 fire detection and suppression system, and high speed abort damper.

G. Dust Collector DC-C138 (Welding)

1. One (1) Airex cartridge collector model ~~DCCH-24~~ **DCCH-16**

   a. Cartridge dust collector model ~~DCCH-24~~ **DCCH-16** complete with 36" paper cartridges, front access doors, venturi assisted reverse automatic pulse cleaning system, adjustable control board for RP in a NEMA 12 enclosure, quick cam cartridge clamping system, hopper, inlet target plate, magnehelic gauge, stand, 55 gallon drum kit, and surge air tank.

2. Construction Details:

   a. Casing:

Material:	black steel
Thickness:	reinforced 12 gauges
Design static pressure:	16 inches water gauge

Cartridge access:	outside, re: access door
Gas inlet:	baffles

b. Tube Sheet:

Quantity:	1
Type:	flat
Material:	black steel
Thickness:	12 gauges, reinforced

c. Filter Media:

Material:	paper
Composition:	P-315-361275
Maximum operating temperature:	200°F

d. Cartridges:

Dimensions:	12 ¾'' dia. X 36'' (L)
Access:	Front horizontal hinged door

e. Venturis:

Type:	Spun
Material:	Steel spinning

f. Cartridges Cleaning System:

Type:	Pulse-jet Cycle 1-2 minute(s)
Compressed air pressure:	100 p.s.i.g.
Air properties:	clean, dry without oil

g. Compressed Air Tank:

Quantity:	1 per module
Size:	5'' x 5'', full length of casing
Location:	side-mounted

h. Diaphragm Valves:

Size:	1 ½''
Manufacturer:	Goyen

i. Solenoid Valves:

Location:	Mounted inside of an NEMA 4 casing beside the compressed air tank

j. Pulse Controller:

System:	Pulse-jet
Operation:	sequence
Control adjustment:	one (1) for pulse timing (adjustable) one (1) for interval between pulse

	(adjustable)Wiring :
	printed circuit with terminal block
Enclosure:	NEMA 5/12
Location:	beside service platform

k. Cartridge Gauge:

Quantity:	1 complete with tubing and connections
Type:	Magnehelic
Range:	0-10 water gauge

l. Support Structure:

Type:	Structural
Clearance:	4'-0'' below hopper

m. Painting:

Standard finish:	1 primer and 2 finishes
Surface preparation:	cleaned and brushed

n. Discharge Equipement:

Quantity:	1
Location:	under collector
Type:	55 gal. Drum kit

3. Blower Model ~~SQB-24.5~~ **SXB-10** includes housing, AMCA C rating, BI wheel, **Direct Drive,** ~~OSHA guard, all belts,~~ matching paint, **top mounted,** ~~<U> base support,~~ and TEFC motor. ~~50HP~~ **30HP**- 460V/3/60, ~~14 000~~ **10,000** CFM @ ~~16''~~ **12"** H2O.
4. Drum kit & steel band clamp.
5. The collector is also specified with a photohelic gauge which cleans the cartridges on demand saving significant volumes of compressed air, while extending the life of all involved components.
6. A fire kit, including a fire temperature probe and sprinkler pipe only are provided to connect to a fire suppressant source.
7. Additional safety features include explosion relief doors on the body of collector, per NFPA 68, and a blow back damper (gravity operated) for the inlet of the collector.
8. A 30" **28"** abort damper assembly, in conjunction with a Hansentek AN104 fire detection and suppression system provides complete fire protection and prevents the propagation of fires within the collector.
9. **Complete control panel including Nema 12 enclosure, magnetic motor starter, fuses, thermal overload, step down transformer, illuminated on/off buttons, three position selector switch, integrated pulse sequencer controller board, and rotary disconnect. CSA approved. 30HP, 460V/3/60**

H. Dust Collector DC-134a ~~& DC-134b~~ (Precision Manufacturing)

1. One (1) Airflow Systems model DC-8-7.5BI-S-BI-Hopper20-Rain cap-7.5-PG-10-Mtr-Str-Mnt model **DC-6-ExpVent-5HP-BI-S-BI-Hopper-20-PG-10-RainCap-5-Motor/Starter** cartridge dust collector with ~~(8)~~ **(6)** Clean II filters (150 sq. ft. media each), Auto-clean Vibra-pulse filter cleaning system, ~~7 ½ Hp~~ **5 HP** TEFC motor, 208-230/460/575/3/60Hz (~~17.2/8.6 amps~~ **12/6 amps**), with backward incline blower with exhaust silencer, rain cap and motor starter mounted to unit, ~~16"~~ **14"** dia. inlet collar on top, Hopper/stand for 20 gallon pail option; hopper with short legs, connecting hose, lid, and 20 gallon pail. 0-10" Magnahelic dial pressure gauge, surface mounted.

2. Construction: 12 ga. steel cabinet with powder-coat finish; includes ~~(4)~~ **(3)** removable end caps for easy filter removal, AMCA type B, non-sparking, aluminum, radial blower wheel, ½" NPT regulator, and motor wired to electrical control box.

   a. Unit: ~~144"H x 54"W x 36"D~~ **108"H x 30"W x 36"D**
   b. Weight: ~~1,480 lbs~~ **743 lbs**

I. Dust Collector DC-134b (Precision Manufacturing)

1. 1- Airflow Systems model 1200VOM-PG-5:

   a. 1000 CFM source capture industrial air cleaner with (1) 2" impingement pre-filter, (1) 2" aluminum mesh filter, (1) 95% main filter (25 sq ft of media), 1 HP TEFC motor, 115/230/1/60 hz, and a 8" dia. Inlet in front only (no side or back inlet). 0-5" Magnahelic dial pressure gauge, surface mounted.
   b. Construction: 16 ga welded steel cabinet with powder-coat finish. Includes Ultra-sealTM filter mounting system, side access door to filters and motor blower compartment, wall mount/rod hanging brackets for installation, 3" deep welded oil sump with 1.5" FPT drain, direct drive blower, on-off switch and 6' power cord for 115v units; 230/1 phase and 3 phase units are wired to side junction box (motor starter not included)

      1) Unit: 16"W x 44"H x 24"D
      2) Weight: 183 lbs

~~J. Dust collection systems include the following:~~

~~1. Building Trades - Provide dust collection system for woodworking equipment: (1) 13,000 CFM cartridge dust collector located outside, (12) extraction arms, (14) equipment connections.~~
~~2. Robotics - Provide dust collection system for the woodworking equipment: (1) 800 CFM portable cartridge dust collector.~~
~~3. Precision Manufacturing - Provide dust collection system for the welding/ferrous metals: (1) 10,000 CFM cartridge dust collector located outside, (5) extraction arms, (15) equipment connections.~~
~~4. CTE Exploration Studio - Provide dust collection system for the woodworking equipment: (1) 6,000 CFM cartridge dust collector located outside, (4) extraction arms, (6) equipment connections. Provide dust collection equipment for welding/ferrous metals: (1) 2,000 CFM cartridge dust collector located outside, (1) extraction arm, (3) equipment connections.~~
~~5. Welding Fabrication - Provide dust collection system for the welding/ferrous metals: (1) 13,000 CFM cartridge dust collector located outside, (1) plasma downdraft table, (22) extraction arms, (4) equipment connections. Provide dust collection system for aluminum: (1) 3000 CFM cartridge dust collector located exterior to building, (1) plasma downdraft table.~~

~~F. Dust collector shall be self-cleaning fabric type complete with cotton filters, backward inclined blower, motorized shaker, factory wired controller and external discharge silencer. Manufacturer's literature shall state that dust collector and selected filter spacing is designed for the collection of wood dust.~~

~~G. Dust collector shall be airtight, all steel construction with sealed seams and gasketed quick opening doors with 1/4 turn knobs. Housing shall be a minimum of 14-ga. mild steel. Unit shall consist of a filter section, with sloped roof to shed rain and a funnel bottom section without slide gates or doors to allow downflow of dust directly into two (2) 55-gallon drum assemblies furnished by manufacturer. Inlet, with baffle, shall be centered on rear of unit for even distribution of dust to the drums. Designs with inlet on narrow side shall not be accepted. Include an explosion relief vent, in the dirty section of the filter housing, per NFPA #664.~~

~~H. Unit to include a multi-pocket filter modules, which is sewn from 8-ounce cotton sateen fabric designed to deliver in excess of 99.5% efficiency by weight on industrial dusts. The filter module shall have rigid insert separators to prevent collapse of filters and loss of the effective filter area.~~

~~Flat shaker fingers located at the bottom of the filter module shall prevent adjoining pockets from touching one another and blanking off. The filter pocket spacing shall be of the wide spacing type (1-1/2") to permit the collected dust to be shaken off the exterior of the filters and recommended by the manufacturer for the collection of wood dust. Fabric media with narrow spacing, open bottom pockets with dust collected inside the pockets or pleated cartridges will not be accepted. Total airflow to filter fabric area (air to cloth ratio) shall not exceed 10 CFM per square foot.~~

~~I. Each filter module shall be secured in place by two lever, operated over-center, locking mechanisms to assure a positive seal and allow for easy removal of filters from outside of unit, without tools. Designs which require entry into unit (confined space), for filter maintenance, are not acceptable.~~

~~J. Filters will be cleaned automatically after a fifteen second delay following the shutdown of the blower, by the oscillating action delivered by the motorized eccentric driven shaker assembly, which imparts a vibratory force throughout the entire surface of each individual filter pocket to dislodge the dust.~~

~~K. Operation of the automatic shaker shall be controlled by a solid state, dual mode timer with adjustable shaker cycle range from 1.8 - 180 seconds. VFD for blower motor, magnetic starter with overload relay for shaker motor and transformer shall be factory wired in a NEMA12 control panel for indoor mounting & wiring by contractor. Outdoor NEMA 3R safety disconnect switches shipped loose for field mounting & wiring by contractor. Also included shall be a push button station for remote mounting.~~

~~L. The control panel wiring shall be either UL or ETL labeled for compliance with 508A. Control panels not labeled by dust collector manufacturer shall be labeled, in field, by a certified UL or ETL representative, prior to placing equipment in operation.~~

~~M. The integral non-sparking AMCA Type C direct drive blower shall be located on the clean air side of the filters, top mounted at the factory and be of the backward inclined design with a dynamically balanced impeller. It shall be driven by a 3450 RPM, TEFC motor. The blower shall be tested in accordance with AMCA Standard 210. A factory-supplied cover shall protect the motor cooling fan from ice.~~

~~N. Discharge noise from the blower shall be attenuated by an external field supported duct silencer fabricated with 4.75 lb. density inorganic mineral or glass fiber. This media shall be protected from erosion by the air flow through the use of galvanized perforated metal with aerodynamic leading and trailing edges to insure maximum acoustical insertion loss at minimum static pressure drop. Lining of the fan scroll, instead of an external silencer, shall not be accepted.~~

~~O. Interior and exterior carbon steel surfaces shall be coated with two part epoxy primer and exterior painted with two-part urethane enamel.~~

2.03 AIR FILTER FAN UNITS (PRECISION MANUFACTURING & CTE EXPLORATION)

A. Airflow Systems Model F70R:

1. 2500 CFM air cleaner with (1) 10 sq. ft. reduced maintenance pre-filter, (1) 65% bag filter (66 sq. ft.), and a ¾ hp TEAO 2-speed motor, 115/1/60 hz
2. Construction: 18 gauge steel cabinet with powder-coat brown finish; includes direct drive, 10x10 blower, 4-way adjustable airfoil blade exhaust grille, 6' power cord with plug, and mounting eye bolts (factory installed).

2.04 EXTRACTION ARMS (PRECISION MANUFACTURING)

A. Airflow Systems model 6P035:

1. Special 5' long, 6" dia. Positioner with vertical (DOWN) wall bracket. (5.5 ft. hose required).

2.05 EXTRACTION ARMS (WELDING)

A. Airflow Systems model 4E05-WB-4:

1. 4" dia. EZ Arm II, 5' long, high performance fume extractor with black aluminum tubes, black hose, external support joint and wall bracket painted black. Specify if up-flange (overhead) or down-flange (table top).

2.06 ACCEPTABLE MANUFACTURERS – VEHICLE EXHAUST SYSTEMS

A. ~~Airflow Systems, Inc~~ **Monoxivent**

B. Approved equal

2.07 VEHICLE EXHAUST SYSTEMS (AUTOMOTIVE TECHNOLOGY & COLLISION)

A. 4 - DSP Monoxivent Model 11244-D:

1. Retractable overhead system, with 24'x4" series 4000 hose, lifting elbow, spring balancer, and clamps.

B. 4 - DSP Monoxivent Model 8004-SC:

1. Adapter, rubber coated with 6" opening to fit 4" hose, with spring clamp.

C. 4 - DSP Monoxivent Model D05-1:

1. D-Series blower, 0.5hp, 115v, 1ph, with wall mounting bracket.

~~D. Furnish and install, where shown on the plans, vehicle exhaust systems for Automotive Technology and Firefighting Science.~~

~~E. Hose Reel Assembly: Constructed of high gloss powder coated 12-, 14- and 16-gauge steel, mounted on an adjustable base of 1.25-inch diameter steel pipe. Drum: 18-inch diameter, 16-gauge steel, secured between two 16-gauge spinnings.~~

~~1. Reel Assembly: 4-inch Hose.~~

~~F. Hose: Rubber flexible hose shall have temperature rating appropriate for the application with minimum rating of 275 degrees F.~~

~~1. 4-inch inside diameter, 25 feet long.~~

~~G. Tailpipe Nozzle:~~

~~1. 4-inch with toggle clamp.~~
~~2. 6-inch rubber adapter for vertical truck exhaust~~

2.08 VEHICLE EXHAUST SYSTEMS (FIRE & EMS)

A. 2 - DSP Monoxivent Model 11245-D:

1. Retractable overhead system, with 24'x5" series 4000 hose, lifting elbow, spring balancer and clamps.

B. 2 - DSP Monoxivent Model 8005-SC:

1. **Adapter, rubber coated with 6" opening to fit 5" hose, with spring clamps.**

C. 2 - DSP Monoxivent Model D10-1:

1. **D-Series blower, 1hp, 115v, 1ph, with wall mounting bracket.**

2.09 ACCEPTABLE MANUFACTURERS - SPARK DETECTION AND EXTINGUISHMENT SYSTEM

A. Hansenteck

B. Acceptable substitute

2.10 SPARK DETECTION AND EXTINGUISHMENT SYSTEM

A. Provide spark detection and extinguishment system to National Fire Protection Association standards (NFPA), 69, 664, and 72 guidelines. The system shall be a single zone control system, as manufactured by Hansentek or approved equal. All components shall be Factory Mutual (FM) approved.

1. Installation requires coordination with sheet metal, plumbing, fire alarm and electrical contractors.

B. The programmable microprocessor panel shall include programmable shutdown, built-in automatic and manual detector sensitivity checking. The system shall provide supervision on all input and output circuits. Fan shutdown relay shall be included, as well as alarm and trouble relays. The system shall have a battery backup power supply and VDC alarm horn.

C. Two (2) 24 addressable infrared direct optic spark detectors with built-in test light for calibrated through the lens sensitivity checking and quick release brackets.

D. Spray assembly with spring-loaded, chrome plated nozzle, 24VDC solenoid, water strainer, mounting flange and gasket.

E. 1" NPT supervised water shut off valve

F. Electrically operated abort gate damper to be located in the return duct and supported by contractor made stand or wall bracket. Abort gate damper shall be activated by the spark detection system.

G. The spark detection and extinguishing system shall be installed indoors and located on and penetrating into a straight horizontal section of the main duct, in the area between the first branch and the dust collector. Based on an air & dust velocity of 4000 fpm in the main duct, the sensor (spark detector) to solenoid valve (spray nozzle) distance (SVD) must be a minimum of 20'. Allow for additional straight duct 1-1/2 duct diameter before and after the detectors and spray nozzle. Flow rate shall be a minimum of 19 GPM at 50 PSI.

H. System shall be installed in accordance with the manufacturer's installation requirements, per the installation manual and tested, commissioned and end-user trained by a factory trained technician before placing the system in operation.

2.11 ACCEPTABLE MANUFACTURERS - INDUSTRIAL DUCT SYSTEMS

I. Nordfab

J. KB Duct

2.12 INDUSTRIAL DUCT SYSTEMS

A. Ducting shall be constructed of ASTM A527 galvanized steel with a G90 rating. Ducting shall be manufactured as follows:

1. Diameters 3" to 24" pipe, adjustable nipples, and collars attached to other components will have one or both ends die formed-rolled to provide a uniform edge around the circumference of the rolled end. The pipe and adjustable nipples shall have the longitudinal seam laser welded to allow for a tighter slip joint and reduce system pressure losses. All laser welded seams will undergo a light test to ensure there are no voids or imperfections in the system. Pipe lengths using laser welded seams will not exceed a nominal 60" length. The rolled edges provide structural support at 5' intervals or less and can be interpreted as a stiffener where SMACNA specifications are required. An adjustable nipple is used for adjustment during the install process. Pipe is cut to appropriate length and the adjustable nipple secures the pipe for install.

2. Pipe and other components larger than 24" shall utilize either an angle flange or flat flange attached loosely and retained in place using a 3/8" vanstone lip. The flanged pipe shall have a compressed interlocking lap form seam and not exceed 78" in length. The angle or flat flanges provide structural support at 6'-6" intervals or less and are considered as stiffeners where SMACNA specifications are required.

3. There will be times when certain components will be air direction sensitive. These components will have an arrow sticker attached showing the proper flow direction.

4. Ducting and its components shall have been tested to +/- 80" WG on pipe diameters 3" to 20" and +80" / -50" WG on sizes 22" to 24", using the following gauged reference:

a. 3" will use 18ga material thickness

b. 4" through 12” will use 22ga material thickness

c. 13" through 29" will use 20ga material thickness

d. 30" and above will use 18ga material thickness

B. Clamping rolled edged duct:

1. Clamps shall be constructed with an over-center, spring-lever action for quick connecting of two pieces of ducting. A retaining pin shall be inserted in the handle and an eyelet on the clamp as a safety feature to ensure the handle does not prematurely come undone.

2. When closing the clamp, the internal seal shall be compressed in such a manner as to cover both rolled beads for optimum sealing capacity in a full 360° pattern.

C. Caulking and other materials governing system temperature ratings as applicable:

1. Approved caulk is 3M Scotch Seal Metal Sealant 2084 or equivalent for system temperatures of 250°F or lower

2. Optional approved caulk is 3M Polyurethane Adhesive Sealant 540 or equivalent for system temperatures of 250°F or lower

D. Sealing O-rings

a. Buna-N, 70 Duro-Meter hardness with a temperature rating of 250°F maximum and is black in color, used with the adjustable nipple

b. Silicone rubber, ZZ-R-765 Class 2A and 2B grade 770 AMS-3304E and 3304F and 3303G, FDA approved and is red in color, used with the adjustable nipple

2. Sealing gaskets

a. Molded gaskets shall meet the material classification of ASTM D-2000 M2BG510 A24 B34 EO14 EO34 EF11 EF21 and used in systems where the temperature rating is 225°F or less and are black in color. This component shall be made using conductive materials for conductivity.

b. Sponge O-ring shall meet the material classification of either ASTM D-1056-68 – SBE43 or ASTM D1056-85, 91, 98 – 2B3.

3. Clamp seals shall be made of either of the following:

a. Nitrile to meet or exceed ASTM D 1056 standards with a temperature rating not to exceed 158°F constant temperature (or intermittent temperature of 194°F).

E. Conductivity: Metal-to-metal contact shall be obtained at all joint connections. Die-formed rolled edges shall be uniform in shape to provide consistent contact. The ears of the clamp shall be in contact with the rolled edges to provide maximum conductivity. Conductivity shall be adhered to per NFPA 77 paragraph 8.4.1.1; which states that all parts of the continuous metal piping system should have a resistance level that does not exceed 10 ohms. Testing shall be the responsibility of the Contractor.

F. Use manufacturer approved flexible ducts and clamps to make final connections to equipment.

~~A. Product Description:~~

~~1. The system is a full line of duct and components. All parts are of standard sheet metal construction with a rolled lip applied to the each end of the component. An all stainless over-center locking clamp is used to encompass the rolled lips, pull them together and then securely join them. Adapters enable connection to virtually any machine or existing duct.~~

~~B. Clamp:~~

~~1. The lifetime guaranteed clamp is fitted with a 'winged- O-ring' gasket made or N-butyl rubber. The gasket is designed to fully encompass the entirety of the rolled lips including the area formed by the 'v' between the rolled lips. Other gasket material is available.~~

~~C. Duct and Adjustability:~~

~~1. The duct is a nominal 5' length. Adjustable sleeves and adjustable components enable the installer to quickly make odd lengths and to adjust for a proper fit. To utilize this feature, a cut piece of pipe is slid into the sleeve or fitting and secured with an O-ring and standard clamp.~~

~~D. Standard Product~~

~~1. Materials:~~

~~a. Material Duct and Components are available in galvanized, stainless (304-316) as a standard.~~

~~2. Gauges:~~

~~a. Duct Standard Gauges for the duct are 26 ga for 3", 24 ga for 4-6", 22 ga for 7-12" and 20 ga for sizes 13-22".~~

~~b. Elbows are typically one gauge heavier than standard duct gauge.~~
~~c. All components (branches, reducers etc) are of 18 ga material.~~

~~E. Product Options~~

~~1. Material:~~

~~a. Carbon steel and galvaneel are available as an option.~~

~~2. Gasket Material:~~

~~a. Viton, Gore-tex, Red Silicone Rubber, Asbestos gaskets and O-ring material are also available.~~

~~3. Gauges:~~

~~a. All duct can be provided in standard configuration in one ga heavier. (24 in 22 , 22 in 20 and 20 in 18).~~
~~b. Rolled lips can be applied to gauges upto 10 ga by applying a rolled lip collar to fully welded duct and components.~~
~~c. Heavy tubed elbows are available.~~

~~F. Pressure Rating~~

~~1. The rolled lip on the duct and fittings act as a stiffing ring and therefore allow the product to withstand much higher pressures than normally associated with spiral or other rolled duct. The duct is typically installed with confidence in pressure applications up to 40" negative water column pressure. Higher pressures guarantees are available. To obtain this simply call K&B.~~

~~G. Galvanized Steel Ductwork:~~

~~1. Unless otherwise specified, all duct, fittings, and hoods shall be a minimum G-90 galvanized sheet metal in accordance with ASTM A525 and A527 specifications.~~
~~2. All ductwork shall be as manufactured by United McGill or acceptable substitute.~~

~~H. Exhaust Duct:~~

~~1. All duct subject to negative pressure shall be of round spiral lockseam construction, suitable for 0 inches wg to -10 inches wg operation.~~
~~2. Duct shall be provided in continuous, un-joined lengths wherever possible. Except when interrupted by fittings, round spiral duct sections shall not be less than 12 feet long.~~
~~3. Ductwork gauge table:~~

~~Diameter Of Duct or Max. Single Side of Hood/Duct~~	~~Minimum Nominal Thickness~~			
	~~Non-Abrasive~~		~~Medium Abrasive~~	~~Abrasive~~
	~~Class A~~	~~Class B~~	~~Class C~~	~~Class D~~
~~0-8~~	~~26g~~	~~24g~~	~~22g~~	~~20g~~
~~9-15~~	~~24g~~	~~22g~~	~~20g~~	~~18g~~
~~15-21~~	~~22g~~	~~22g~~	~~18g~~	~~16g~~
~~22-30~~	~~20g~~	~~20g~~	~~18g~~	~~16g~~
~~Over 30~~	~~18g~~	~~18g~~	~~16g~~	~~14g~~

~~4. System classification and materials:~~

~~a. Industrial collection system:~~

~~1) Class C - Galvanized Steel.~~

5. Exhaust fittings:

a. All exhaust system fittings shall be round and shall have a wall thickness **as indicated in 2.12.A** ~~two gauge numbers (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected~~.
b. Elbows shall be 90-degree die stamped for **sizes up to 7" and seven-gore segmented for sizes larger than 7"** ~~Class A systems and seven-gore **segmented**, 90-degree elbows for Class B and C systems~~.
c. Converging-flow fittings shall be constructed with no excess material projecting from the body into the branch entrance.

1) Lateral fittings shall be constructed so that airstreams converge at angles of 45 degrees or less.
2) All branch entrances shall be by means of factory-fabricated fittings or factory-fabricated duct/tap assemblies.

d. Balancing dampers shall be provided where indicated on the Drawings. The dampers shall be equivalent to **Nordfab QF** ~~United McGill Model CF~~, full frame cut-off blast gates.
e. Vertical stack heads shall be equivalent to United McGill Model WV stack heads.
f. ~~Duct connectors for Class A and B shall be standard duct couplings equivalent to United McGill SRNCF.~~ Duct connectors ~~for Type C~~ shall be suitable for material handling applications equivalent to United McGill SRSCI. **Duct system shall be primarily clamp together and use of duct connectors shall be limited.**
g. Fasteners: Rivets, bolts, and sheetmetal screws the same materials as the ductwork (lengths shall be as short as practical to fasten properly).

~~6. Duct joint and fitting sealants:~~

~~a. Interior ductwork:~~

~~Transverse joints and duct wall penetrations shall be sealed with Uni-Cast7 two-part tape sealing system, which is a combination of an adhesive activator and woven-fiber tape impregnated with a gypsum mineral compound. Sealing system shall be formulated to withstand temperatures from !40 deg. F to +200 deg. F. Sealing system shall have a UL Classification with a flame spread and smoke developed of zero (0) when tested on both 18-gauge galvanized steel and inorganic reinforced cement board, at a coverage of at least 31 square feet per gallon.~~

~~b. Exterior ductwork:~~

~~All transverse construction joints shall be factory-sealed with United McGill Uni-Weather duct sealant, or equivalent. Sealant shall be formulated to withstand temperatures from -20 to +300 deg. F. Sealant shall be formulated such that surface preparation or solvent cleaning is not necessary. Sealant shall exceed 500 hours without becoming brittle under ASTM D572 test conditions (oxygen bomb).~~

7. Hangers and supports:

Duct supports and hangers shall be of the same materials as the ductwork and shall comply with SMACNA standards and per drawing details.

8. Access doors:

Ductwork conveying materials shall have hinged type access doors suitable for system conveying materials. Access doors shall be equivalent to United McGill Model ASHXFSDC.

9. Hood construction:

   Hood construction shall be to the dimensions as detailed on the Drawings, or as required for the application. Hood construction shall be externally welded stainless steel as indicated. All surfaces and joints shall be smooth without sharp edges or protrusions.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install equipment **and duct systems** in accordance with manufacturer's instructions.

B. Do not operate fans for any purpose until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

C. Install fans with resilient mountings and flexible electrical leads.

D. Provide pitot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Refer to Sections 23 89 00 and 23 91 00 for additional duct construction information and requirements.

G. **Ducting serving dust collection systems shall be clamp together by Nordfab or KB Duct. Ducting shall be specifically designed to handle abrasive material with appropriate pipe, clamps, gasketing, seals, etc. for complete systems.**

H. Use manufacturer approved flexible ducts and clamps to make final connections to equipment.

I. All duct systems shall maintain a continuous ground to meet NEC requirements.

END OF SECTION

SECTION 23 97 50

BUILDING AUTOMATION SYSTEM

(Mechanical Trade Bid Required)

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Building Automation System (BAS).

1.02 RELATED DOCUMENTS

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

B. All related Specification sections shall be used in conjunction with this Section.

C. Refer to Section 012300 – ALTERNATES.

1.03 DESCRIPTION

A. The BAS shall be as indicated on the drawings and described in these specifications. The BAS shall be a complete system of direct digital control (DDC) electric/electronic temperature and motor controls to provide the specified sequences. The control systems in general shall consist of all DDC controllers, network controllers, thermostats and temperature sensors, automatic operators, control valves, duct mounted automatic dampers, switches, relays, specified control panels, indicators, transformers, time clocks, communication wiring and interlocking wiring between control components and equipment.

B. BAS must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed by equipment manufacturers as specified in respective sections. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.

C. The BAS Contractor shall provide an operator workstation server as part of this project.

D. The Sanford School District presently has a Trane District-Wide BAS with central operator workstation located in the existing "Maintenance Building". The intent of this specification is to provide a new central operator workstation located in the new "Sanford High School and Technical Center" **and continue to use** ~~that will extend and interoperate with~~ the existing central operator workstation. **The Sanford High School and Technical Center BAS shall be accessible from both the new and existing operator workstations. The BAS Contractor shall configure both operator workstations to provide access to graphics and for monitoring, control and trending.** ~~The existing Trane District-Wide BAS presently serves the following buildings:~~

~~1. Sanford High School~~
~~2. Sanford Regional Technical Center~~
~~3. Memorial Gym~~

~~4. Willard School~~
~~5. Lafayette School~~
~~6. Carl J. Lamb School~~
~~7. BRIDGE Program~~
~~8. Margaret Chase Smith School~~
~~9. Maintenance Building~~

E. Contractor shall configure graphic displays, trending and alarming to meet Owner's requirements.

F. The BAS shall meet both BACnet and LonTalk communication standards to ensure the system maintains "interoperability" to avoid proprietary arrangements that will make it difficult for the Owner to consider other BAS manufacturers in future projects.

G. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data shall be limited only by operator password. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

H. The mechanical systems and terminal devices shall be provided with DDC controls that will permit each system to operate in a stand-alone fashion. As such, in the event of a BAS network communication failure, or the loss of an individual controller, the other DDC controllers shall continue to independently operate and communicate to the BAS.

I. Communication between DDC controllers and operator workstation shall be over a high-speed network. All nodes on this network shall be peers. The operator shall not have to know the controller identifier or location to view or control a point (object). Application Specific Controllers shall be constantly scanned by the Building Controllers to update point information and alarm information globally.

J. The BAS manufacturer shall provide all hardware and software necessary to implement the functions and sequence of operations specified.

K. Magnetic motor starters shall be supplied with 120 volt control transformer and a normally open and normally closed auxiliary contact.

L. All mechanical, electrical, and plumbing equipment installed under this project shall be equipped with and served by new building automation and automatic temperature control system components.

M. The installation of the BAS shall be performed under the direct supervision of the BAS manufacturer with the shop drawings, flow diagrams, bill of materials, component designation or identification number, sequence of operations, and graphic display layout screens all bearing the name of the manufacturer.

1.04 ACCEPTABLE MANUFACTURERS

A. Base Bid: The following manufacturers/installers are acceptable subject to meeting requirements of the specification:

1. Trane Controls installed by Trane, Inc. (Basis-of-Design)
2. Johnson Controls installed by Johnson Controls, Inc.
3. Siemens Controls installed by Siemens Building Technologies
4. Honeywell Controls installed by Honeywell, Inc.

B. Alternate No.12: The following manufacturers/installers are acceptable subject to meeting requirements of the specification:

1. Trane Controls installed by Trane, Inc. (Basis-of-Design)
2. No substitutes.

1.05 QUALITY ASSURANCE

A. BAS Manufacturer Qualifications

1. The BAS manufacturer shall have an established business office within 50 miles of the project site and must provide 24 hours/day, 7 days/week response in the event of a customer warranty or service call.
2. The BAS Manufacturer shall have factory trained and certified personnel providing all engineering, service, startup, and commissioning field labor for the project from their local office location. BAS manufacturer shall be able to provide training certifications for all local office personnel upon request.
3. The BAS shall be provided by a single manufacturer and this manufacturer's equipment must consist of operator workstation software, web-based hardware/software, Open Standard Protocol hardware/software, Custom application Programming Language, Graphical Programming Language, Building Controllers, Custom Application Controllers, and Application Specific Controllers.
4. Independent representatives of BAS manufacturers are not acceptable. BAS vendor must be corporate owned entity of BAS manufacturer.

B. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.

1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
2. National Electrical Code -- NFPA 70.
3. Federal Communications Commission -- Part J.
4. ASHRAE/ANSI 135-1995 (BACnet) - (System Level Devices) - Building Controllers and PC Operator Workstations communicating on an Ethernet/IP protocol shall permit interoperability with other various building system manufacturers that are BACnet approved systems.
5. EIA-709.1 LonTalk Standard and EIA 901.2 (LonMark Certification) - (Unit Level Devices) - Custom Application Controllers and Application Specific Controllers shall use FTT-10A transceivers and support the LonTalk communication protocol utilizing Standard Network Variable Types (SNVT) as defined by Echelon Corporation. This standard communication protocol provides interoperability with hundreds of other various building system manufacturers' control systems and devices.

C. All products used in this installation shall be currently manufactured, and shall have been applied to a minimum of three previous projects. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing prior to bid date. Spare parts shall be available for at least 5 years after completion of this contract.

1.06 SYSTEM PERFORMANCE

A. Performance Standards. The BAS system shall conform to the following:

1. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points. All current data shall be displayed within 20 seconds of the operator's request.
2. Graphic Refresh. The system shall update all dynamic points with current data within 30 seconds.

3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 10 seconds. Analog objects shall start to adjust within 10 seconds.
4. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current within the prior 60 seconds.
5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds.
6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
7. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
8. Multiple Alarm Annunciations. All workstations on the network shall receive alarms within 5 seconds of each other.
9. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

B. Reporting Accuracy

Measured Variable	Reported Accuracy
Space temperature	±1°F
Ducted air	±2°F
Outside air	±2°F
Water temperature	±1°F
Delta-T	±0.25°F
Relative humidity	±5% RH
Water flow	±5% of full scale
Air flow (terminal)	±10% of 10% to 100% scale
Air flow (measuring stations)	±5% of reading
Air pressure (ducts)	±0.1" W.G.
Air pressure (space)	±0.01" W.G.
Water pressure	±2% of full scale
Electrical Power	5% of reading
Carbon Monoxide (CO)	± 50 PPM
Carbon Dioxide (CO2)	± 50 PPM

1.07 SUBMITTALS

A. BAS manufacturer shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software being provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats once they have been approved and as-built drawings have been completed.

B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the BAS manufacturer of furnishing quantities required based upon contract documents.

C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with the specifications or which is deemed valuable in documenting and understanding the system to be installed.

D. Submit the following:

1. A complete bill of materials of equipment to be used indicating quantities, manufacturers and model numbers.
2. A schedule of all control valves including the valve size, pressure drop, model number (including pattern and connections), flow, CV, body pressure rating, and location.
3. A schedule of all control dampers including damper size, pressure drop, manufacturer, and model number.
4. Provide all manufacturers' technical cut sheets for major system components. When technical cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means.
5. Each submitted product literature and drawings shall clearly reference the specification page and section number and/or drawing number associated with the product. This is to include:

    a. Building Controllers
    b. Custom Application Controllers
    c. Application Specific Controllers
    d. Operator Workstations
    e. Portable Operator Terminals
    f. Auxiliary Control Devices
    g. Proposed Building Automation System architectural diagram depicting various controller types, workstations, device locations, addresses, and communication cable requirements.
    h. Detailed termination drawings showing all required field and factory terminations, as well as terminal tie-ins to DDC controls provided by mechanical equipment manufacturers. Terminal numbers shall be clearly labeled.
    i. Points list showing all system objects and the proposed English language object names.
    j. Sequence of operation for each controlled mechanical system and terminal end devices.
    k. Provide a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet system level device (i.e. Building Controller & Operator Workstations) type. This defines the point list for proper coordination of interoperability with other building systems if applicable for this project.
    l. Provide LonMark Certification and functional profile SNVT's for unitary-level controllers (i.e. chillers, RTU's, AHU's, Terminal VAV boxes, FCU's, UV's, etc.) for interoperability with other building systems if applicable for this project.
    m. Color printouts of proposed operator graphics including a list of points for workstation display.

E. Project Record Documents: Upon completion of installation, submit record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:

1. Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .dwg or .dxf drawing files shall also be provided.
2. Testing and Commissioning Reports and Checklists signed off by trained factory (equipment manufacturers) and field (BAS) commissioning personnel.
3. Operating and Maintenance (O & M) Manuals - These shall be as-built versions of the submittal product data. In addition to the information required for the submittals, Operating & Maintenance manual shall include:

    a. Names, address and 24-hour/7-day per week telephone numbers of Contractor personnel managing and installing equipment, along with service personnel responsible for supporting the ongoing warranty and services of the control system.
    b. Procedures for operating the BAS including logging on/off, alarm management, generation of reports, trends, overrides of computer control, modification of setpoints, and other interactive system requirements.
    c. Description of the programming language including syntax, statement descriptions, algorithms, calculations, point database creation and modification, program creation and modification, and operator use of the editor.

d. Explanation of how to design and install new points, new DDC controllers, and other BAS hardware.
e. Preventative Maintenance and calibration procedures; hardware troubleshooting; and hardware repair and/or replacement procedures.
f. Documentation of all software program logic created for Custom Programmable Controllers including the overall point database. Provide one set of magnetic media containing files of the software and point database.
g. One set of electronic media containing files of all operator color graphic screens for the project.
h. A list of recommended spare parts including pricing, manufacturer, supplier, and part numbers.
i. Documentation, installation, and maintenance information for all third party hardware/software products provided including personal computers, printers, hubs, sensors, valves, etc.
j. Original issue media for all software provided, including operating systems, programming language, operator workstation software, and graphics software.
k. Licenses, Guarantee, and Warranty documents for all equipment and systems.
l. Recommended preventive maintenance procedures for all system components including a schedule of tasks (inspection, cleaning, calibration, etc.) and task descriptions.

F. Training Manuals: The BAS manufacturer shall provide a course outline and copies of training manuals at least two weeks prior to the start of any corporate training class to be attended by the Owner.

1.08 OWNERSHIP OF PROPRIETARY MATERIAL

A. All project developed hardware and software shall become the property of the Owner. This includes but is not limited to:

1. Operator Graphic files
2. As-built hardware design drawings
3. Operating & Maintenance Manuals
4. BAS System software database
5. Controller application programming databases
6. Application Specific Controller configuration files
7. Required Licensed software

1.09 BAS ARCHITECTURE

A. All building level BAS devices, controllers, etc., shall be connected together using twisted shielded wiring between each device in a daisy chain manner. This communications system shall operate completely independently of the building communications wiring and independent of the building level communications network.

B. The BAS database and interface software shall reside on a server based computer. This server shall connect to the building level network. The server shall have a complete database of the BAS.

C. The BAS shall be able to be fully accessed by an authorized user from any BAS workstation computer. The BAS shall allow the following data exchange to/from the BAS system, for up to five concurrent users (based on user authorization level):

1. Analog temperature values.
2. Temperature set point adjustments.
3. Valve position indicators.

4. Equipment status indications.
5. Graphic representation of all equipment controlled.
6. Alarm reporting (all temperature set point values and equipment status indicators shall be configured as alarms; temperature alarms shall be high and low).
7. Programming of controllers
8. Creation of programs and new points
9. Save and reload of controllers
10. Real time program editor
11. The BAS will have the ability to import/export data automatically into Microsoft Excel, Word and Access for custom reporting.

1.10 INTEROPERABILITY WITH EQUIPMENT CONTROLLERS

A. General:

1. The BAS shall be included with BACnet I/P communication protocol for interoperating with multiple building systems supplied by different manufacturers. The BAS shall be able to receive, react to, and in some cases, return information from multiple building systems.
2. Point inputs and outputs from the third party controllers shall have real time interoperability with BAS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Dial up and Local Area Network Communications.

B. Networking/Communications:

1. The BAS shall support any combination of third party controllers (if more than one third party manufacturer is being integrated) on a single network.
2. A minimum of 100 third party controllers shall be supported on a single network.
3. Integration shall be by RS 485 technologies.
4. Diagnostics/Verification:
5. The installer/operator shall have the ability to verify, and diagnose communication messages and point information between third party controllers and the BAS.

C. Point Inputs and Outputs:

1. The BAS shall be able to monitor and control third-party controller point inputs and outputs provided by equipment supplied with packaged controls that use standard communication protocols.

1.11 WORK RESPONSIBILITY

A. The BAS Contractor shall provide all temperature sensors and transmitters, thermostats, controllers, automatic valves and dampers, valve and damper operators, control panels, electronic, and electric equipment, computer hardware, software, programming, and appurtenances, and other accessory equipment along with a complete system of electrical wiring to fulfill the intent of the specification and provide for a complete and operable system:

B. All control equipment shall be fully proportioning, except as noted otherwise. All damper and valve actuators shall be electric.

C. The initial system programming shall include the set up of all building occupancy schedules and trend logs. Coordinate with the Owner's operating personnel to receive scheduling and trend log requirements.

D. Products, systems, and equipment which the BAS contractor shall integrate into, but which are not furnished or installed by the BAS Contractor, include (but are not necessarily limited to):

1. Variable frequency drives.
2. Packaged rooftop dehumidification units.
3. Packaged rooftop air conditioning units.
4. Variable refrigerant flow systems.
5. Electrical meter.
6. Refer to other Division 22, 23 and 26 specification sections for additional products, systems, and equipment integration and monitoring requirements.

E. The following incidental work shall be furnished by the Designated Contractor under the supervision of the BAS Contractor:

1. The Division 23 Mechanical Contractor shall:

   a. Install automatic valves, flow stations, valved pressure taps, wells, and piping accessories and equipment that are specified to be supplied by the BAS Contractor.
   b. Furnish and install all necessary service valves, and water, drain and overflow connections and piping.
   c. Provide, on magnetic starters and/or motor controls furnished, all necessary auxiliary contacts, with buttons and switches in the required configurations.

2. The Division 23 Sheet Metal Contractor shall:

   a. Install dampers, flow stations, taps, and other duct accessories and equipment that are specified to be supplied by the BAS Contractor.
   b. Furnish and install all necessary balancing dampers, duct accessories, and ductwork.
   c. Provide access doors or other approved means of access through ducts for service of control equipment.

3. The General Contractor shall:

   a. Provide access doors or other approved means of access through ceilings and walls for service of control equipment.

1.12 ELECTRIC WIRING

A. Except for power and control wiring specifically shown on the electrical drawings or called for in the electrical specifications, electric wiring, interlock wiring and wiring connections required for the installation of the BAS, shall be provided by the BAS Contractor. This requirement includes any required mounting and field wiring of control devices furnished with mechanical equipment.

B. All wiring shall comply with the requirements of the electrical section of the specification (Division 26). In addition, the following shall apply:

1. All exposed wiring shall be in EMT. Exposed wiring allowed only in mechanical rooms and at underside of floor/roof in areas without ceilings.
2. All wiring down through floors shall be in EMT and concealed in shafts and walls.
3. All wiring to wall mounted sensors shall be in EMT and concealed in walls.
4. All wiring within accessible ceilings shall be allowed to be plenum rated cable supported from UL Listed J-hook supports.
5. All control cabinets shall be UL listed in accordance with NEC 508a and labeled as an assembly.
6. All control wiring shall be plenum rated.

1.13 ACCEPTANCE PROCEDURE

A. Upon completion of system(s) calibration, the BAS Contractor shall startup the system and perform all necessary trouble shooting and run diagnostic tests to ensure proper operation. The BAS Contractor shall be responsible for generating all software and entering all database information necessary to perform the sequence of operations and specified software routines. An acceptance test in the presence of the Owner's representative or Engineer shall be performed.

B. The BAS Contractor and the Balancing Contractor shall check the BAS for conformance to Drawings and Specifications including location of components and correct sequence of operations. The Balancing Contractor shall report the results in writing to the Engineer. The Engineer and BAS Contractor shall do a performance test of the system including checking the sequence of operations.

C. The Mechanical Contractor and BAS Contractor shall instruct the Owner in the proper operation of the mechanical systems as specified.

1.14 PRE-INSTALLATION CONFERENCE

A. Under provisions of Division 01, convene a conference one week prior to commencing work of this section.

B. Require attendance of parties directly affecting the work of this Section.

C. Review locations of field equipment (control panels), work schedules and required coordination with other trades.

1.15 COORDINATION

A. Coordinate work under provisions of Division 01 and applicable sections of Division 23 and Division 26.

B. Ensure that installation of components is complementary to installation of similar components of other systems.

C. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

D. Ensure that systems are complete and commissioned.

1.16 WARRANTY

A. The BAS indicated on the drawings and herein specified, shall be warranted to be free from original defects in both material and workmanship for a period of two (2) year of normal use and service, excepting damages from other causes. This warranty shall become effective starting the date of Substantial Completion.

1. Provide all repair and maintenance services (scheduled and unscheduled), materials, and equipment necessary for the successful operation of the entire BAS system for a period of two (2) years after date of Substantial Completion. This shall include all adjustment, required testing, and repair of all systems, all computer equipment, transmission equipment, sensors, control devices, and appurtenances.
2. On line support services shall be provided by the BAS Contractor to remotely monitor and control the BAS. This remote service shall be provided within two (2) hours of the time that a problem is reported. This coverage shall include normal business hours, after business hours, weekends, and holidays.

3. If the reported problem cannot be resolved on line by the local office, the national office of the BAS manufacturer shall have the same capabilities for remote connection to the facility. If the problem cannot be resolved with on line support services, the BAS manufacturer shall dispatch the appropriate personnel to the job site to resolve the problem within 3 hours of the time that a problem is reported.
4. Prior to completion of the warranty period, the BAS Contractor shall submit to the Owner a proposal for continuation of scheduled maintenance on an annual basis.

PART 2 – PRODUCTS

2.01 COMMUNICATION ARCHITECTURE

A. This project shall be comprised of a high speed Ethernet network utilizing BACnet/IP communications between System Controllers and Workstations. Communications between System Controllers and sub-networks of Custom Application Controllers and/or Application Specific Controllers shall utilize BACnet MSTP (RS485) communications.

1. The Owner will provide all communication media, connectors, repeaters, network switches, and routers necessary for the high speed Ethernet network. An active Ethernet port will be provided adjacent to each System Controller and operator interface (PC) for connection to this high speed Ethernet network.
2. Active Ethernet data drops will be limited to six (6) for System Controllers and one (1) for operator workstation (PC). No additional Ethernet data drops will be provided for BAS Communication.
3. All values within the system (i.e. schedules, datalogs, points, software variables, custom program variables) shall be readable and controllable (where appropriate) by any System Controller or BACnet Workstation on the communications network via BACnet.

B. Peer-to-Peer Building Level Network:

1. All operator devices shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the peer-to-peer network. No hardware or software limits shall be imposed on the number of devices with global access to the network data at any time.
2. The network shall support a minimum of 100 DDC controllers and PC workstations.
3. Each PC workstation shall support a minimum of 4 peer to peer networks hardwired or dial up.
4. The system shall support integration of third party systems via panel mounted open protocol processor. This processor shall exchange data between the two systems for inter-process control. All exchange points shall have full system functionality as specified herein for hardwired points.
5. The system shall allow for alarms to be sent via e-mail to any workstation on the network and to an alpha-numeric pager.

C. DDC Controller Floor Level Network:

1. This level communication shall support a family of application specific controllers and shall communicate with the peer-to-peer network through DDC Controllers for transmission of global data.
2. Auto-dial/auto-answer communications shall be provided to allow DDC Controllers to communicate with remote operator stations and/or remote terminals via telephone lines.
3. Auto-dial DDC Controllers shall automatically place calls to workstations to report alarms or other significant events. The auto-dial program shall include provisions for handling busy signals, "no answers" and incomplete data transfers.
4. Operators at dial-up workstations shall be able to perform all control functions, all report functions and all database generation and modification functions as described for

workstations connected via the network. Routines shall be provided to automatically answer calls from remote DDC Controllers. The fact that communications are taking place with remote DDC Controllers over telephone lines shall be completely transparent to an operator.

D. The BAS including the peer-to-peer building level network and the DDC controller floor-level network shall be able to be fully accessed by an authorized user from any intranet or Internet connected computer.

2.02 DDC CONTROLLERS

A. DDC Controllers shall be 16-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient to fully meet the requirements of this specification and/or the sequences of operation. Each controller shall support a minimum of three (3) Floor Level LAN Device Networks.

B. Each DDC Controller shall have sufficient memory to support its own operating system and databases, including, but not necessarily limited to:

1. Control processes.
2. Energy management applications.
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified.
5. Maintenance support applications.
6. Custom processes.
7. Operator I/O.
8. Dial-up communications.

C. Each DDC Controller shall support flash firmware upgrades without the need to replace hardware.

D. Provide all processors, power supplies and communication controllers so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring.

E. DDC Controllers shall provide a minimum two RS-232C serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. DDC Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers or terminals.

F. Each DDC Controller shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The DDC Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.

G. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

H. In the event of the loss of normal power, there shall be an orderly shutdown of all DDC Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

1. Upon restoration of normal power, the DDC Controller shall automatically resume full operation without manual intervention.
2. Should DDC Controller memory be lost for any reason, the user shall have the capability of reloading the DDC Controller via the local RS-232C port, via telephone line dial-in, or from a network workstation PC.

2.03 HVAC MECHANICAL EQUIPMENT CONTROLLERS

A. HVAC Mechanical Equipment Controllers shall be 12-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors.

B. Each HVAC Mechanical Controller shall have sufficient memory to support its own operating system and databases, including, but not necessarily limited to:

1. Control processes.
2. Energy management applications.
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified.
5. Maintenance support applications.
6. Custom processes.
7. Operator I/O.
8. Dial-up communications.

C. Each HVAC Mechanical Equipment Controller shall support firmware upgrades without the need to replace hardware.

D. HVAC Mechanical Equipment Controllers shall provide an RS-232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals.

E. HVAC Mechanical Equipment Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

F. Each HVAC Mechanical Equipment Controller shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all components. The HVAC Mechanical Equipment Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.

G. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:

1. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3 V.
2. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact.
3. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500 V signal, 1 kV power.
4. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max).
5. Isolation shall be provided at all peer-to-peer panel's AC input terminals to suppress induced voltage transients consistent with:

   a. IEEE Standard 587-1980.
   b. UL 864 Supply Line Transients.
   c. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11).

H. In the event of the loss of normal power, there shall be an orderly shutdown of all HVAC Mechanical Equipment Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

1. Upon restoration of normal power, the HVAC Mechanical Equipment Controller shall automatically resume full operation without manual intervention.
2. Should HVAC Mechanical Equipment Controller memory be lost for any reason, the user shall have the capability of reloading the HVAC Mechanical Equipment Controller via the local RS-232C port, via telephone line dial-in, or from a network workstation PC.
3. Provide a separate HVAC Mechanical Equipment Controller for each AHU or other HVAC system as indicated in this section and/or as appropriate to the sequences of operation. It is intended that each unique system be provided with its own point resident DDC Controller.

2.04 DDC CONTROLLER RESIDENT SOFTWARE FEATURES

A. General:

1. The software programs specified in this Section shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer for execution.

B. Control Software Description:

1. The DDC Controllers shall have the ability to perform the following pre-tested control algorithms:

   a. Two-position control.
   b. Proportional control.
   c. Proportional plus integral control.
   d. Proportional, integral, plus derivative control.
   e. Automatic tuning of control loops.

C. DDC Controllers shall have the ability to perform any or all the following energy management routines:

1. Time-of-day scheduling.
2. Calendar-based scheduling.
3. Holiday scheduling.
4. Temporary schedule overrides.
5. Start-Stop Time Optimization.
6. Automatic Daylight Savings Time Switch-over.
7. Night setback control.
8. Dry bulb economizer switch-over.

D. DDC Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

1. A single process shall be able to incorporate measured or calculated data from any and all other DDC Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC Controllers on the network. Database shall support 30 character, English language point names, structured for searching and logs.
2. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.

3. DDC Controller shall provide a HELP function key.
4. DDC Controller shall be capable of comment lines for sequence of operation explanation.

E. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device, or communications with other panels on the network.

1. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.
2. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, DDC Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each DDC Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.
3. Alarm reports and messages will be directed to a user-defined list of operator devices or PCs based on time (after hour’s destinations) or based on priority.
4. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200 character alarm message to more fully describe the alarm condition or direct operator response.
5. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.
6. Alarm messages will be sent via e-mail to any workstation on the network and to designated alpha-numeric pagers.

F. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified in the I/O summary and/or sequences of operation.

1. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each DDC Controller's point group. Two methods of collection shall be allowed: either by a pre-defined time interval or upon a pre-defined change of value. Sample intervals of one (1) minute to seven (7) days shall be provided. Each DDC Controller shall have a dedicated RAM-based buffer for trend data. All trend data shall be available for use in third party personal computer applications (i.e., Microsoft Excel, Lotus 1-2-3).
2. DDC Controllers shall also provide high resolution sampling capability for verification of control loop performance. Operator-initiated automatic and manual loop tuning algorithms shall be provided for operator-selected PID control loops as identified in the point I/O summary and/or sequences of operation.

   a. Loop tuning shall be capable of being initiated either locally at the DDC Controller, from a network workstation, or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.

G. DDC Controllers shall be capable of automatically accumulating and storing run-time hours for digital input and output points and automatically sample, calculate and store consumption totals for analog and digital pulse input type points, as specified in the point I/O schedule and/or sequences of operation.

H. The peer to peer network shall allow the DDC Controllers to access any data from, or send control commands and alarm reports directly to any other DDC controller, or combination of

controllers on the network without dependence upon a central or intermediate processing device. DDC Controllers shall send alarm reports to multiple workstations without dependence upon a central or intermediate processing device. The peer to peer network shall also allow any DDC Controller to access, edit, modify, add, delete, back up, and restore all system point database and all programs.

I. The peer to peer network shall allow the DDC controllers to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control the points that the operator is authorized for. All other points shall not be displayed on the PC workstation or portable terminal (e.g., all base building and all tenant points shall be accessible to any base building operators, but only tenant points shall be accessible to tenant building operators). Passwords and priorities for every point shall be fully programmable and adjustable.

2.05 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. Each DDC Controller shall be able to extend its performance and capacity through the use of remote application specific controllers (ASCs) through Floor Level LAN Device Networks.

B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor. Provide the following types of ASCs as a minimum:

1. Central System Controllers.
2. Terminal Equipment Controllers.

C. Each ASC shall be capable of control of the terminal device independent of the manufacturer of the terminal device.

D. Central System Controllers:

1. Provide for control of central HVAC systems and equipment including, but not limited to, the following:

   a. Air handling systems.
   b. Hot water systems.

2. Controllers shall include all points, inputs, and outputs necessary to perform the specified control sequences. For motors not equipped with hand/off/automatic switches as part of the electrical control equipment (i.e., as part of motor starters or variable frequency drives), provide a hand/off/automatic switch for each digital output for manual override capability.
3. Each controller shall support its own real-time operating system. Provide a time clock with battery backup to allow for stand-alone operation in the event communication with its DDC Controller is lost and to insure protection during power outages.
4. All programs shall be field-customized to meet the user's exact control strategy requirements. Central System controllers utilizing pre-packaged or canned programs shall not be acceptable. As an alternative, provide DDC Controllers for all central equipment in order to meet custom control strategy requirements.
5. Programming of central system controllers shall utilize the same language and code as used by DDC Controllers to maximize system flexibility and ease of use. Should the system controller utilize a different control language, provide a DDC Controller to meet the specified functionality.
6. Each controller shall have connection provisions for a portable operator's terminal. This tool shall allow the user to display, generate or modify all point databases and operating programs.

a. The terminal shall provide the user with the following functionality as a minimum:

1) View and set date and time.
2) Modify and override time-of-day schedules.
3) View points and alarms.
4) Monitor points.
5) Command and modify set points.

b. Should the system controller be unable to interface to a door-mounted terminal, provide a laptop or similar terminal at the controller, or provide a DDC Controller with a door-mounted or local terminal in lieu of the system controller in order to meet the specified minimum functionality.

E. Terminal Equipment Controllers:

1. Provide for control of each piece of equipment , including, but not limited to, the following:

a. As required by the sequences of operation.

2. Controllers shall include all point inputs and outputs necessary to perform the specified control sequences. Analog outputs shall be industry standard signals such as 24V floating control, allowing for interface to a variety of modulating actuators. Terminal controllers utilizing proprietary control signals and actuators shall not be acceptable. As an alternative, provide DDC Controllers or other ASCs with industry standard outputs for control of all terminal equipment including pneumatic actuation.

2.06 SYSTEM SERVER

A. All computer hardware specified herein, and as required to make the BAS complete and operable, shall be provided by the BAS Contractor. All required computer software, programming, and labor for computer hardware and overall system set-up shall also be provided by the BAS Contractor.

B. The following technical data for the main computer hardware is considered "up to date" for the purpose of the BAS, and shall represent the minimum level of hardware to be provided.

1. System shall utilize a server class PC tower located in Custodial Room B055
2. Two Xeon 2.8GHz, 1MB L3 cache processors
3. 2GB, DDR266 SDRAM memory
4. DVD+R/W or CD ROM
5. Microsoft Windows Server 2003 (IIS 6.0) Or Server 2008, IIS V7 +
6. Microsoft SQL Server 2005
7. .NET Framework 1.1 BJE: .NET 3.5
8. Furnish all required serial, parallel, and network communication ports, and all cables for proper system operation. The server shall include a minimum 17", color monitor with 1024 x 768 screen resolution.

2.07 GRAPHICAL USER INTERFACE SYSTEM

A. Basic Interface Description:

1. Operator workstation interface software shall minimize operator training through the use of English language prompting, English language point identification and industry standard PC application software. The software shall provide, as a minimum, the following functionality:

a. Real-time graphical viewing and control of environment.
b. Scheduling and override of building operations.
c. Collection and analysis of historical data.

d. Point database editing, storage and downloading of controller databases.
e. Alarm reporting, routing, messaging and acknowledgment.

2. Provide a graphical user interface which shall minimize the use of the keyboard through the use of a mouse or similar pointing device and "point and click" approach to menu selection. There shall be a minimum of 8 pre-defined function keys to allow quick access to frequently used applications.
3. The software shall provide a multi-tasking type environment which allows the user to run several applications simultaneously. BAS software shall run within a 32 bit operating system such as Windows XP. These Windows applications shall run simultaneously with the BAS software. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able to work in Microsoft Word, Excel, and other Windows based software packages, while concurrently annunciating on-line BAS alarms and monitoring information.

   a. Provide functionality such that any of the following may be performed simultaneously on-line, and in any combination, via user-sized windows:

      1) Dynamic color graphics and graphic control.
      2) Alarm management, routing to designated locations, and customized messages.
      3) Week-at-a-Glance Time-of-day scheduling.
      4) Trend data definition and presentation.
      5) Graphic definition and construction.
      6) Program and point database editing on-line.

   b. If the software is unable to display several different types of displays at the same time, the BAS contractor shall provide at least two operator workstations at no additional cost to the Owner.
   c. Report and alarm printing shall be accomplished via Windows program manager, allowing use of network printers.

4. Multiple-level password access protection shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password. A minimum of six levels of access and 50 passwords shall be supported.
5. Operator Activity Tracking: An audit trail report to track system changes, accounting for operator initiated actions, changes made by a particular person or changes made to a specific piece of equipment, designated time frame, shall be printable and archived for future use. The operator activity tracking shall be in a tamper -proof buffer file.
6. Reports shall be generated on demand or via pre-defined schedule and directed to either CRT displays, printers or disk. As a minimum, the system shall allow the user to easily obtain the following types of reports:

   a. A general listing of all or selected points in the network.
   b. List of all points currently in alarm.
   c. List of all points currently in override status.
   d. List of all disabled points.
   e. List of all points currently locked out.
   f. List of user accounts and access levels.
   g. List all weekly schedules.
   h. List of holiday programming.
   i. List of limits and dead bands.
   j. Excel reports.
   k. System diagnostic reports including, list of DDC panels on line and communicating; status of all DDC terminal unit device points.
   l. List of programs.

m. Custom configurable lists of any user-defined object in the system.

7. Scheduling and Override: Provide a calendar based graphical spreadsheet-type format for simplification of time-of-day scheduling and overrides of building operations. It should allow scheduling at least one year in advance. Schedules reside in both the Primary and Secondary Servers and DDC Controllers to ensure time equipment scheduling when PC is off-line; PC is not required to execute time scheduling. Provide override access through menu selection or function key. Provide the following spreadsheet graphic types as a minimum:

   a. Weekly schedules.
   b. Zone schedules, minimum of 500 unique zones.
   c. Monthly calendars.

8. Collection and Analysis of Historical Data:

   a. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals or change of value, both of which shall be user-definable. Trend data may be stored on hard disk for future diagnostics and reporting. Additionally, trend data may be archived to network drives or removable disk media for future retrieval.
   b. Trend data reports shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or predefined groups of at least six points. Provide additional functionality to allow predefined groups of up to 250 trended points to be easily transferred on-line to Microsoft Excel. DDC contractor shall provide custom designed spreadsheet reports for use by the owner to track energy usage and cost, equipment run times, equipment efficiency, and/or building environmental conditions. DDC contractor shall provide setup of custom reports including creation of data format templates for monthly or weekly reports.

B. Dynamic Color Graphic Displays:

1. Complete color graphic floor plan displays and system schematics for each piece of mechanical equipment, including, but not limited to, air handling units and exhaust fans, hot water systems and chilled water systems, shall be provided by the BAS Contractor for the systems included in the sequences of operation of this specification to optimize system performance analysis and speed alarm recognition.
2. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based commands. Graphics software shall permit the importing of AutoCAD or Bitmap drawings for use in the system.
3. For system schematics at individual pieces of equipment, occupancy schedules, set points, status, alarm status, and written sequence of operations, shall be displayed or shall be available by direct link.
4. Dynamic temperature values, humidity values, flow values, valve and damper positions, and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates. All flow valves shall be in units generally accepted as standard in the industry (i.e., air flow in "CFM"; water flow in "GPM"; temperature in "°F"; pressure in "psig"; etc.). Valve and damper position shall be indicated as an actual percentage value, not voltage value.

   a. Analog bars in 3 sizes shall be available for monitor and control of analog values; high and low alarm limit settings shall be displayed on the analog scale. The user shall be able to "click and drag" the pointer to change the set point.

b. Provide the user the ability to display blocks of point data by defined point groups; alarm conditions shall be displayed by flashing point blocks.
c. Equipment state can be changed by clicking on the point block or graphic symbol and selecting the new state (on/off) or set point.

5. Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable.
6. Off the shelf graphic software, Microgafx Designer or Coral Draw software shall be provided to allow the user to add, modify or delete system graphic displays.
7. A clip-art library of HVAC and automation symbols shall be provided including fans, valves, motors, chillers, AHU systems, standard ductwork and piping diagrams and symbols. The user shall have the ability to add custom symbols to the clip-art library.
8. System Configuration & Definition:

a. Network-wide control strategies shall not be restricted to a single DDC Controller, but shall be able to include data from any and all other network panels to allow the development of Global control strategies.
b. Provide automatic backup and restore of all DDC controller databases on the workstation hard disk. In addition, all database changes shall be performed while the workstation is on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate DDC Controller. Changes made at the DDC Controllers shall be automatically uploaded to the workstation, ensuring system continuity.
c. System configuration, programming, editing, graphics generation shall be performed on-line.

C. Alarm Management:

1. Alarm Routing shall allow the user to send alarm notification to selected printers, alphanumeric pagers or PC location via e-mail based on time of day, alarm severity, or point type.
2. Alarm Notification shall be provided via two alarm icons, to distinguish between routine, maintenance type alarms and critical alarms. These alarm icons shall be displayed when user is working in other Windows programs. The BAS alarm display screen shall be displayed when the user clicks on the alarm icon.
3. Alarm Display shall list the alarms with highest priority at the top of the display. The alarm display shall provide selector buttons for display of the associated point graphic and message.
4. Alarm messages shall be customizable for each point to display detailed instructions to the user regarding actions to take in the event of an alarm.

D. Workstation Communications:

1. Provide automatic dial-up communications for buildings as specified. Automatic dial-up communications shall include the following features as a minimum:

a. Dial-Out:

1) Manual dial-out from the workstation to remote networks shall be accomplishable using only a mouse to select and request the desired remote connection.

b. Dial-In:

1) Alarms shall automatically dial into the workstation for display at the terminal and for hard copy printout at the associated event printer.

2. Alarms shall, at the operator's option, dial into a stand-alone modem-printer to provide for real-time alarm printouts even when the workstation is off-line (such as when it is being used to run operator-selected third-party software).
3. Trend data shall be scheduled for automatic updating to the workstation at operator-selected times. The operator shall also have the option of manually collecting trend data at any time.

E. Web Browser Clients:

1. The graphical user interface system shall be capable of supporting an unlimited number of clients using a standard Web Browser such as Internet Explorer™. Systems requiring additional software resident on the client machine or manufacture-specific browsers shall not be acceptable.
2. The Web Browser client shall support at a minimum, the following functions:

   a. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication techniques to prevent unauthorized access shall be implemented.
   b. Graphical screens developed for the graphical user interface shall be the same screens used for the Web Browser client. Storage of the graphical screens shall be in the system, without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
   c. Depending on user access privileges, the user shall be able to view data, modify and command objects such as start/stop, and adjust set points. In addition, users can be provided with the ability to view logs and view and acknowledge alarms.

3. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. The capability to limit the user to just their home page shall be provided. From the home page, links to other views, or pages in the system shall be possible.
4. Graphic screens on the Web Browser client shall support hypertext links to other Web pages on other Internet or intranet sites.

F. Object Library:

1. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.
2. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
3. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.
4. The library shall include applications or objects for the following functions:

   a. Scheduling Object. Provide a BACnet compliant, 7-day plus holiday and temporary scheduling object to allow for a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
   b. Calendar Object. Provide a BACnet compliant 12-month calendar object to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling-objects for effective event control.
   c. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals

d. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
e. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start/stop time object properties based on the previous day's performance.
f. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

5. At a minimum, the library shall include services to support LonWorks or BACnet networks.
6. The library shall include control objects for the following functions at a minimum:

a. Analog Input Object - Minimum requirement is to meet the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
b. Analog Output Object - Minimum requirement is to meet the BACnet standard for data sharing.
c. Binary Input Object - Minimum requirement is to meet the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
d. Binary Output Object - Minimum requirement is to meet the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme must also be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing this contention resolution shall not be acceptable.
e. PID Control Loop Object - Minimum requirement is to meet the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
f. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.

g. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
h. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.
i. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.
j. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.
k. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.

7. The object library shall include objects to support common LonMark devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering.

2.08 SAFETY DEVICES

A. Low Limit: Electric type, with 20 foot long serpentine element, with manual reset and set for 35°F for "freeze" protection and 48°F or 55°F for fan discharge application. Double pole, double throw.

B. High Limit: Electric high temperature thermostats shall have bimetal type sensing element with insertion length appropriate for the application. These shall be two position manual reset type.

C. Smoke Detectors: The Electrical Contractor shall provide duct smoke detectors and all associated wiring to signal the building fire alarm system. The BAS Contractor shall provide wired and hardwired interlock to the respective fan motor controller(s) and/or control panel to shutdown the equipment and signal an alarm at the operator's workstation.

D. Smoke dampers: Smoke dampers are furnished and mounted by the sheet metal contractor. The Electrical Contractor shall wire, 120 VAC, and control all smoke dampers via supervised fire alarm control modules. The BAS shall monitor smoke damper end switch and shutdown the equipment and signal an alarm at the operator's workstation.

E. Condensate Pan Overflow Switch: Model ACS-3 as manufactured by Little Giant, or acceptable substitute. Switch rated for 120/250 volts with maximum current of 11 amps.

2.09 AIR FLOW MEASUREMENT STATIONS

A. Where air flow measurement stations are required by the sequence of operations, and where such measurement stations are not specified to be furnished integral to equipment, the required measurement stations shall be furnished by the BAS Contractor. Where such measurement stations are furnished integral to equipment, provide all required transducers, wiring, etc., required for interface to the BAS.

B. Air measurement devices shall be of the temperature compensated velocity type, Ebtron Gold series.

C. Air flow monitoring is required for the following equipment (refer to other specification sections and coordinate with equipment manufacturers as required):

1. All air handling units.

~~**2.10 FLOW METERS**~~

A. ~~Flow meter stations are required at primary heating water service. Meters shall be provided by the Mechanical Contractor and wired by the BAS Contractor~~.

2.11 FIELD DEVICES

A. All devices should conform to those already in use at this facility unless otherwise specified herein.

B. Temperature Sensors:

1. Room sensors serving offices, classrooms and conference rooms shall have LCD display night override button, and set point slide adjustment override options. The set point slide adjustment shall be able to be software limited to limit the amount of room adjustment. Room sensors serving toilet rooms, common areas, and other public spaces shall not have set point adjustment. Room sensors serving the gymnasium shall be provided with high impact guards.
2. Room sensors shall have sensing accuracy of 0.5°F, display accuracy and resolution shall be a minimum of 1°F.
3. Some specialty sensors and sensor accessories (different from those indicated above) are required for this project. Specific requirements for this are indicated on the drawings.

C. Duct Temperature Sensors:

1. Duct temperature sensors shall be averaging nickel wound resistance type. Sensors shall be 10,000 ohms at 77°F and have an accuracy of 0.25%. AHU's shall have duct temperature sensors installed to allow monitoring of the discharge air temperature, return air temperature, outside air temperature, and mixed air temperature at the operator's workstation. If supply or return duct size exceeds 48" x 48" then the use of an averaging temperature sensor mounted in the duct is required. Access to be provided to duct via an access door supplied and installed by the sheet metal contractor. (Outside air temperature may be sensed globally for the entire facility).

D. Humidity Sensors:

1. Humidity sensor elements shall be of the all polymer capacitive type with an active range of 0% to 100%. Accuracy of space humidity sensors shall be 5% at 77°F in the 20% to 95% range. Duct humidity sensors shall have an accuracy of 3% over the same range.
2. Outdoor humidity sensors shall be of the aspirated type, located in a sealed enclosure, protected from the sun. Outdoor air humidity sensors shall have a 0% to 100% range. Where the specifications require outdoor air humidity monitoring for enthalpy and other control sequences, a single outdoor air humidity sensor may be installed provided the control system is capable of true peer-to-peer data sharing between local control processors. If local control processors are not capable of sharing data without relying on the network control processors, a separate humidity sensor must be installed at each controller where such data is required.

E. Dampers, sized for specific application:

1. Automatic dampers shall be furnished by the BAS Contractor except where specified as part of packaged equipment. Dampers shall be single or multiple blades as required. Dampers are to be installed by the sheet metal contractor under the supervision of the temperature control contractor. All blank off plates and conversions necessary to install smaller than duct size dampers shall be the responsibility of the sheet metal contractor.
2. Provide automatic control dampers as indicated, with damper frames not less than formed 13 gauge galvanized steel. Provide mounting holes for enclosed duct mounting. Provide damper blades not less than formed 16-gauge galvanized steel, with maximum blade width of 8".
3. All blades are to be of airfoil or corrugated type construction. Airfoil blades shall be of extruded or cast metal. Corrugated blades shall be fabricated from two (2) sheets of No. 22 galvanized sheet steel, spot welded together. Blades are to be suitable for high velocity performance.
4. Secure blades to 2" diameter zinc plated axles using zinc plated hardware. Seal off against spring stainless steel blade bearings. Provide blade bearings of nylon and provide thrust bearings at each end of every blade. All damper bearings are to be made of oil impregnated plastic, or permanently lubricated ball bearings. Construct blade linkage hardware of zinc plated steel and brass. Submit leakage and flow characteristics plus size schedule for controlled dampers.
5. Operating Temperature Range: From -20 to 200°F (-29 to 93°C).
6. For standard applications as indicated, provide parallel or opposed blade design (as selected by the manufacturer's sizing techniques) with optional closed cell neoprene edging.
7. For low leakage applications as indicated, provide parallel or opposed blade design (as selected by manufacturer's sizing techniques) with inflatable steel blade edging, or replaceable rubber seals, rated for leakage less than 10 cfm/sq.ft. of damper area, at differential pressure of 4" w.g. when damper is being held by torque of 50 inch pounds.

    a. For dampers in outside air intake or exhaust systems, replaceable butyl rubber seals are to be provided. Seals are to be installed along the top and bottom of each blade edge. Blade end seals shall be made of stainless steel. Seals shall provide a tight closing, low leakage damper.

F. Damper Operators, sized for specific application:

1. Automatic damper operators shall be furnished by the BAS Contractor except where specified as part of packaged equipment. They shall be quiet in operation and shall have ample power to overcome friction of damper linkage and air pressure acting on louvers to position dampers accurately and smoothly. The damper operator mounting arrangement shall be outside the airstream whenever possible.

2. Provide spring returns where required by the sequences of operation and/or as appropriate for the application.
3. Damper operators shall close tight against the differential pressure involved.

G. Automatic Control Valves, sized for specific application:

1. Electric Automatic Control Valves:

   a. Automatic control valves for fin tube radiation and radiant panels shall be 2-position. All other automatic control valves (including, but not limited to, variable air volume box and constant air volume box heating coil valves) shall be fully proportional.
   b. Valve bodies to be three-way mixing or two-way normally open or normally closed to suit application. Bodies 2" and less to be 250 psig bronze, screwed connection, bronze seats, equal percentage plugs, stainless steel stems with Teflon7 packing. Bodies over 2" to be 125 psig iron, flanged connection with modified equal percent plug. Valve selection to be based on maximum 3 psig drop across fully open valve.
   c. All control valves shall be sized by the control manufacturer and shall be guaranteed to meet the performance required or specified. Water control valves shall be suitable for 125 PSIG working pressure and sized for 3 psi maximum allowable pressure drop.

H. Valve Operators, Sized for Specific Application:

1. Automatic valve operators shall be quiet in operation and fail safe in either normally open or normally closed position. All valve operators shall be capable of operating in sequence when required by the sequence of operation.
2. Valve operators shall have electric actuator.
3. Valve operators shall close tight against the differential pressure involved.

I. Aquastats:

1. Furnish immersion type electric; two position electric thermostats for all required applications, except strap on two position electric thermostats will be acceptable for cabinet and propeller unit heaters.

J. Differential Pressure Flow Switches (Water):

1. Flow status by differential pressure switches measuring the differential pressure between the supply and return lines. The set point shall be adjustable between 5 and 50 PSIG, or between 20 and 100 PSIG, as appropriate to the application, with an operating differential pressure of 2 PSI. The set point for heating system booster pumps shall be adjustable down to 2 PSIG. Maximum pressure difference between bellows shall be 120 PSI. The switches shall signal the operator workstation of loss of flow and, where applicable, allow for the activation of a stand by pump. Pump status shall be monitored by differential pressure switches (or by motor current switches).

K. Differential Pressure Flow Switches (Air):

1. Air flow switches shall be provided to monitor filter differential pressure. The switches shall have an adjustable set point range of 0.05" to 5.00" W.C. (field selectable). Air flow switches shall be provided to signal the operator's workstation (where applicable) of supply, return, and/or exhaust fan status for every AHU (supply, return, and exhaust fans independent). Fan status shall be monitored by differential pressure switches (or by motor current switches).

L. Pressure Transmitters:

1. Pressure transmitters shall have stainless steel diaphragms and shall be accurate to 1.0% of full scale and repeatability shall be less than 0.3% of full scale. The ranges for all pressure transmitters shall be as necessary to ensure proper control of the systems without exceeding the sensing range of the transmitter. Static pressure sensors shall be selected as appropriate for the application. Static pressure readings shall be reported to the operator's workstation.

M. Current Switches:

1. Fan and pump motor status shall be monitored by adjustable reading current switches (or by differential pressure switches). Sensors shall provide ON/OFF indication at the operator's work station.

2.12 DDC CONTROL RELAYS

A. Relay modules shall contain two or four SPDT line voltage relays (Form C) and Hand-Off-Auto override switches. Each relay shall have a LED to indicate an energized state.

2.13 MISCELLANEOUS CONTROL DEVICES

A. Furnish all other required control devices as required to fulfill the specified sequences of operation.

PART 3 – EXECUTION

3.01 PROJECT MANAGEMENT

A. Provide a designated project manager who will be responsible for the following:

1. Construct and maintain project schedule.
2. On site coordination with all applicable trades and subcontractors.
3. Authorized to accept and execute orders or instructions from Architect/Engineer.
4. Attend project meetings as necessary to avoid conflicts and delays.
5. Make necessary field decisions relating to this scope of work.
6. Coordination/Single point of contact.

3.02 START-UP AND TESTING

A. When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on line. All testing, calibrating, adjusting and final field tests shall be completed by the installer. Verify that all systems are operable from local controls in the specified failure mode, upon panel failure or loss of power.

1. Test all controlled mechanical equipment in concert with the mechanical contractor.
2. Test fire alarm monitoring in concert with the electrical contractor and speciality electrical subcontractors. Refer to Specification Division 26.

B. Provide any recommendation for system modification in writing to the Architect/Engineer. Do not make any system modification, including operating parameters and control settings, without prior approval of Architect/Engineer.

3.03 ADJUSTING AND CLEANING

A. Start Up: Start up, test, and adjust control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

B. Schedules: The initial system programming shall include the set up of all building occupancy schedules and trend logs. Coordinate with the Owner's operating personnel to receive scheduling and trend log requirements.

C. Cleaning: Clean factory finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch up paint.

D. Final Adjustment: After completion of installation, adjust thermostats, sensors, control valves, motors and similar equipment provided as work of this section.

1. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.

3.04 TRAINING AND CLOSEOUT PROCEDURES

A. The Contractor shall provide a factory trained instructor to give full instruction to designated personnel in the operation of the system installed. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. The BAS Contractor shall provide all "students" with a student binder containing product specific training modules for the system installed. All training shall be held during normal working hours of 8:00 am to 4:30 PM weekdays.

B. Owner's Instructions: Provide services of manufacturer's technical representative to instruct Owner's personnel in operation and maintenance of control systems.

1. Provide a minimum of 16 on site hours of training for Owner's designated operating and maintenance personnel, in multiple sessions (up to 4 sessions total) at intervals convenient to the Owner. Training shall include, but is not limited to:

   a. Explanation of drawings, operations and maintenance manuals.
   b. Walk through of the job to locate control components.
   c. Operator workstation and peripherals.
   d. DDC controller and ASC operation/function.
   e. Operator control functions including graphic generation and field panel programming.
   f. Explanation of adjustment, calibration and replacement procedures.
   g. Student binder with training modules.
   h. Schedule instruction with Owner; provide at least seven (7) day notice to Contractor and Engineer of training dates.

C. All training shall be coordinated with the Mechanical Contractor. Refer to Specification Section 23 01 00.

D. Since the Owner may require personnel to have more comprehensive understanding of the BAS, additional training must be available from the BAS Contractor. If such training is required by the Owner, it will be contracted at a later date

PART 4 – SEQUENCE OF OPERATIONS

NOTE: All set points indicated in the Sequences of Operation shall be adjustable, unless otherwise noted.

4.01 GENERAL

A. Low voltage power for air terminals, control valves, etc. shall be from control power transformers located in mechanical and/or electrical rooms at BAS panel locations (transformers located in ceiling spaces are not allowed). Installation of controls and all wiring to be provided by the BAS Contractor.

B. All control functions shall be direct digital controls (DDC) unless otherwise noted.

C. All modulating output points shall use PID control loops.

D. All on/off control points shall have adjustable minimum on and off time delays to prevent short cycling of equipment.

E. All DDC setpoints shall be adjustable. Setpoints listed within the sequences are suggested starting points. The BAS Contractor to adjust setpoints to suit actual working conditions and to meet Owner requirements.

F. BAS Contractor to perform calibrations each season during the first year of operation as part of commissioning and system warranty period.

G. Setpoints and time delays shall be adjustable by the BAS operator without hardware or software revisions.

H. Hand-Off-Auto switches for equipment controlled through the BAS shall be located in the associated DDC control panels and monitored through the BAS.

I. Motors with variable frequency drives shall have the following control points connected to the BAS through hard-wired terminations:

1. Start/Stop (Binary Output)
2. Speed Control (Analog Output)
3. Alarm/Fault (Binary Input)
4. Safeties (Local Interlocks)

J. Motors with variable frequency drives shall have the following control points connected to the BAS through a communications interface port:

1. Start/Stop (Binary Output)
2. Speed Control (Analog Output)
3. Status (Binary Input)
4. Alarm/Fault (Binary Input)
5. Safeties (Local Interlocks)

K. Motors without variable frequency drives shall have the following control points connected to the BAS through hard-wired terminations:

1. Start/Stop (Binary Output)
2. Speed Control for ECM Motors (Analog Output)
3. Amperage Sensor for Motors > 0.5 HP (Analog Input)

4. Amperage Status for Motors < 0.5 HP (Binary Input)

L. The BAS contractor shall provide airflow stations to measure outside air, supply air, return air and exhaust air flow for all air handling units. The air flow stations shall be used to measure the air entering and leaving the system during operation. The BAS contractor shall coordinate with the balancing contractor in order to calibrate air flow stations, establish damper positions, and to establish the proper tracking of fans.

M. Fail-Safe positions are positions that devices will go to when de-energized: NO = Normally Open, NC = Normally Closed. Device fail safe positions shall be spring driven.

N. Whenever a unit is off per the control system or the main power is disconnected, the control devices for the unit shall go to their fail-safe positions.

O. Occupied/Unoccupied mode shall be scheduled through the BAS. Provide override pushbutton switch on space temperature sensors in private areas for timed override of unoccupied mode.

P. Optimized start/stop for morning warm-up & cool-down cycles shall be determined by the BAS.

4.02 ALARMS

A. High and low limits shall be programmed into all sensors. When limits are exceeded, alarm shall be generated and logged by the BAS at the operator workstations.

B. Fan and pump status shall be monitored by the BAS through adjustable current switches, current sensors or VFD output as indicated above. If commanded status differs from measured status, an alarm shall be generated and logged by the BAS at the operator workstations.

C. All alarm messages generated at the operator workstations shall consist of descriptive English language text indicating time, date and exact nature of the alarm condition.

D. All alarms deemed “critical” or “dispatch alarms” shall also transmit alarm signal via security system, text message and/or email (coordinate with Owner).

4.03 DUCT SMOKE DETECTORS

A. Duct smoke detectors shall be furnished under Division 26 and installed by the Division 23 Contractor in the main supply and return air ducts associated with air handling units. Wiring to fire alarm system shall be part of work of Division 26 and wiring to shutdown associated supply and return air fans shall be by BAS Contractor.

4.04 SMOKE DAMPERS

A. Smoke dampers shall be furnished and installed by the Mechanical Contractor and wired by the Division 26 Contractor.

4.05 HOT WATER HEATING SYSTEM ~~(B-1 AND BP-1)~~ (B-1, 2, 3, 4, 5 AND HWP-1, 2)

A. General

1. A packaged control system shall be provided by the boiler manufacturer. This shall include a computerized boiler burner control system which shall be an integrated, solid state, digital micro-processing, modulating device, complete with sequence indication, fault reset, mode selection, and parameter setpoints. The boiler controller shall provide for both flame safeguard and boiler control and shall perform the following functions:

a. Burner sequencing control with safe start check, pre-purge, pilot ignition, post purge, and UV scanner to prove combustion.
b. Flame supervision control with pre-purge and post-purge and trending to maintain a running history of operating hours, number of cycles, and most recent faults. The control shall be connected to a keyboard display module.
c. Safety shutdown with display of error.
d. Modulating control of the variable speed fan for fuel/air input relative to load requirements.
e. Gas pressure supervision, high and low.
f. Combustion air proving supervision.
g. High air pressure supervision, back draft too high.
h. The supply temperature and set-point temperature shall be displayed at all times on the touch screen display.
i. Controller shall be equipped with a touch screen display for set up, troubleshooting, and operational display, and shall include ModBus communication capability of this information.
j. Include the programming of system circulating pump.

2. A system integration control shall be provided by the boiler manufacturer to stage up to 8 boilers. The control shall include automatic selection of needed boilers based on energy demand, an adjustable outdoor reset schedule, domestic hot water priority, and a system digital display. The control shall force each boiler to a lower fire, before allowing any boiler to operate at high fire. This allows for inverse efficiency (lower fire rate, higher efficiency). The control shall monitor supply water temperature, return water temperature and shall communicate between boilers via RS-485 wiring.

3. The BAS shall communicate with the packaged control system using a BACnet interface. In general, the BAS Contractor scope of work shall be:

a. Control wiring for BAS communication and field installed devices. **Field installed devices include supply header temperature sensor, outdoor air temperature sensor and boiler isolation valves.**
b. Programming and set-up of the BAS to send/receive and trend points available through the packaged control system.
c. Overall commissioning of unit controls including coordination with sub-contractors and unit manufacturer's start-up technician.

B. Hot Water Supply Temperature Reset

1. The controller shall measure the supply water temperature and modulate the burner to maintain supply water temperature setpoint as determined by the BAS.
2. Supply Water Temperature Reset: The supply water temperature setpoint shall reset as follows:

a. The supply water temperature setpoint shall be 160°F when outside air temperature is below 20°F.
b. As outside air temperature rises from 20°F to 60°F, the supply water temperature setpoint shall reset downwards from 160°F to 120°F.
c. The supply water temperature setpoint shall be 120°F when outside air temperature is above 60°F.

C. Pump Run Conditions **(HWP-1, 2)**

1. The pump**s** shall be enabled to run whenever outside air temperature is less than 60°F (adj.) or there is a heating demand in a definable number of zones.
2. To prevent short cycling, the pump**s** shall run and be off for minimum adjustable times (both user definable).

D. Pump Lead/Lag Operation (HWP-1, 2)

1. The pumps shall operate in a lead/standby fashion.

a. The lead pump shall run first
b. On failure of the lead pump, the standby pump shall run and the lead pump shall turn off

2. The designated lead pump shall rotate upon one of the following conditions (user selectable):

a. manually through a software switch
b. if pump runtime (adj.) is exceeded
c. daily
d. weekly
e. monthly

E. Differential Pressure Control

1. The controller shall measure hot water differential pressure and modulate the pump variable frequency drive (VFD) to maintain differential pressure setpoint of 10 psig (adj.). The differential pressure sensor shall be located 2/3 downstream in the system. The differential pressure setpoint shall be field adjusted during system testing and balancing to meet requirements of actual field conditions. The VFD minimum speed shall not drop below 20% (adj.).
2. The differential bypass valve shall normally be closed, but shall modulate to maintain differential pressure setpoint if pump is at minimum speed and pressure setpoint is exceeded.

F. Temperature Monitoring: The following temperatures shall be monitored.

1. Hot water supply
2. Hot water return
3. Outside air temperature

G. Boiler Interface Monitor

1. Status and operating conditions of the boilers shall be monitored through a BACnet communication interface. The interface ~~will~~ **shall** monitor and trend **twenty (20) points per boiler to be determined by Owner** ~~the points as shown on the points list~~.

H. VFD Interface Monitor

1. Status and operating conditions for each pump VFD shall be monitored through a BACnet communication interface. The interface shall monitor and trend points as shown on the points list.

I. Alarms: Alarms shall be provided as follows.

1. Boiler Flame Failure.
2. Pump Failure: Commanded on, but the status is off.
3. Pump in Hand: Commanded off, but the status is on.
4. Pump Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).
5. Pump VFD Alarm/Fault.
6. High Hot Water Supply Temp: If greater than 200°F (adj.)
7. Low Hot Water Supply Temp: If less than 100°F (adj.)
8. High Hot Water Differential Pressure: If 25% (adj.) greater than setpoint
9. Low Hot Water Differential Pressure: If 25% (adj.) less than setpoint

J. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Differential Pressure	x								x	x	x
Hot Water Supply Temp	x								x	x	x
Hot Water Return Temp	x								x		x
Outside Air Temp	x								x	x	x
Differential Bypass Valve		x							x		x
Pump Speed **(Typical of 2)**		x							x		x
Pump Status **(Typical of 2)**			x						x		x
Pump VFD Alarm/Fault **(Typical of 2)**			x							x	x
Pump Start/Stop **(Typical of 2)**				x					x		x
Supply Water Temperature Setpoint						x			x		x
Boiler Burner Cycles					x				x		x
Boiler Operating Hours					x				x		x
Boiler Operating Temperature					x				x		x
Boiler Supply Water Temperature					x				x		x
Boiler Return Water Temperature					x				x		x
Boiler Firing Status							x		x		x
Boiler Flame Failure							x			x	x

4.06 PACKAGED ROOFTOP DEHUMIDIFICATION UNITS (DHU-1A, 1B, 2, 3, 4, 5, 6B, 7, 8, 9, 10, 11, 12)

A. General

1. A packaged control system shall be provided by the rooftop unit manufacturer. The packaged control system shall include the following features:

    a. Standalone microprocessor controls with local display and BACnet connection for BAS interface.
    b. All control devices mounted and wired except for devices required to be remotely mounted. These devices to be factory furnished and field installed by BAS Contractor.
    c. BACnet communication protocol to end devices.
    d. Clock and scheduling function for occupancy with separate occupied and unoccupied setpoints. Scheduling shall be through the BAS with backup provided by integral time clock upon loss of communication with BAS.
    e. Non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
    f. Supply and exhaust fans with motor protection devices and variable frequency drives.
    g. Energy recovery wheel with motor protection device and variable frequency drive.
    h. Dampers and damper actuators.
    i. Refrigeration system components.
    j. Anti-cycle timing and minimum equipment run/off times.

2. The BAS shall communicate with the packaged control system using a BACnet interface. In general, the BAS Contractor scope of work shall be:

    a. Overall coordination with rooftop unit manufacturer.
    b. Control wiring for BAS communication and field installed devices.
    c. Programming and set-up of the BAS to send/receive and trend points available through the packaged control system.
    d. Overall commissioning of unit controls including coordination with sub-contractors and unit manufacturer's start-up technician.

3. The rooftop unit shall perform the following functions:

    a. Operate with 100% outside air during occupied periods and 100% return air in unoccupied mode.
    b. Dehumidify and cool supply air prior to delivery to spaces.
    c. Provide airflow to duct mounted heating coils for space heating.
    d. Recover energy in exhaust air using energy recovery wheel.

4. Whenever the unit is shut down by command of the control system or power disconnect, all control devices associated with the system shall revert to the normal state or position. Outside air, return air and exhaust air dampers shall be equipped with end switches to prove positions.
5. After a power interruption, the rooftop unit shall automatically restart in the mode appropriate to the operating schedule.
6. The BAS shall include logic to stagger rooftop unit startups to limit electrical surges.
7. Control device state or position shall be as follows for the various modes of operation:

Mode	Supply Fan	Exhaust Fan	Energy Recovery Wheel	Cooling System	OA Damper	EA Damper	RA Damper
Power Loss	OFF	OFF	OFF	OFF	CLOSED	CLOSED	OPEN
Unoccupied	OFF	OFF	OFF	OFF	CLOSED	CLOSED	OPEN
Unoccupied Dehum.	ON	OFF	OFF	ON & MOD	CLOSED	CLOSED	OPEN
Unoccupied Night Purge	ON	ON	JOG	OFF	OPEN	OPEN	CLOSED
Unoccupied Heating	ON	OFF	OFF	OFF	CLOSED	CLOSED	OPEN
Occupied Dehum.	ON	ON	ON	ON & MOD	OPEN	OPEN	CLOSED
Occupied Cooling	ON	ON	ON	ON & MOD	OPEN	OPEN	CLOSED
Occupied Heating	ON	ON	ON	OFF	OPEN	OPEN	CLOSED
Energy Recovery - Economizer	ON	ON	JOG	TBD	OPEN	OPEN	CLOSED
Energy Recovery - Frost Protection	ON	ON	ON & MOD	OFF	OPEN	OPEN	CLOSED

B. Unit Start Initiation

1. The start sequence shall be initiated through one of the following methods:

   a. Enable switch is placed in the “Hand” position at controller.
   b. Enable switch is placed in the “Auto” position at controller and remote BAS enable contacts are closed.

2. The unit shall be commanded to run through the BAS based upon an operator adjustable schedule or when a definable number of unoccupied zones require heating or there is a dehumidification demand. Upon loss of BAS communications, unit shall run based upon time clock provided with packaged controls.
3. In addition, the following control method shall be available for operator selection:

a. Local Override: The unit shall run for 2 hours (adj.) upon activation of override at any zone.

C. Optimal Start

1. The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied setpoints as determined by the BAS. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures.

D. Night Purge Cycle

1. The unit shall start and run in economizer mode during unoccupied periods when conditions are appropriate for night purge cycle. Night purge cycle shall be initiated when

   a. Outside air temperature falls 10ºF (adj.) below average space temperature
   b. AND average space temperature is greater than 70ºF (adj.)
   c. AND outdoor air enthalpy is below 24 btu/lb (adj.)
   d. AND outdoor air temperature is above 50ºF (adj.)

2. Night purge cycle shall stop when

   a. Average space temperature falls to within 5°F (adj.) of outside air temperature
   b. OR average space temperature falls below 70ºF (adj.)
   c. OR outdoor air enthalpy rises above 24 btu/lb (adj.)
   d. OR outdoor air temperature drops below 50ºF (adj.)

3. During night purge cycle associated terminal heating and cooling units shall remain off.

E. Occupied Periods

1. Unit Start and Fan Control: Upon start sequence initiation, outside air and exhaust air dampers shall open and prove open. The energy recovery wheel shall start and run at full speed. The exhaust fan shall start and run at minimum speed. After a 15-second (adj.) delay, the supply fan shall start and run at minimum speed. After a 30-second (adj.) delay, the supply fan and exhaust fan airflow controls shall be enabled. The following two fan control methods shall be available for operator selection:

   a. Method #1 Predetermined Speeds (Default for Classroom Units): The supply and exhaust fans shall slowly ramp up in unison to predetermined speeds necessary to achieve design airflows. The BAS contractor shall coordinate with the balancing contractor in order to establish variable frequency drive setpoints necessary to obtain the required airflows.
   b. Method #2 Exhaust Airflow Tracking (Default for Shop Units): The supply and exhaust fans shall slowly ramp up in unison. Supply fan shall ramp up to predetermined speed necessary to achieve design airflow. Exhaust fan shall ramp up to exhaust airflow setpoint equal to a percentage of the supply air flow minus <u>local exhaust airflow</u>. Status of associated exhaust fans shall determine <u>local exhaust airflow</u>. Unit exhaust airflow setpoint shall be 90% (adj.) for Classroom Units and 120% (adj.) for Shop Units. Local exhaust fans associated with each unit are as follows:

      1) DHU-4: EF-C134
      2) DHU-5: EF-C121 and VE-1, 2, 3, 4

   c. Airflow stations shall be factory installed in unit to measure supply airflow and exhaust airflow. The air flow stations shall be used to measure the air entering and leaving the

system during operation. The BAS contractor shall coordinate with the balancing contractor in order to calibrate air flow stations.

2. Dehumidification Mode: This mode shall be initiated when outside air dew-point downstream of the energy recovery wheel is above 48ºF (adj.). Compressor #1 shall start and modulate to maintain evaporator leaving air temperature setpoint of 48ºF (adj.). If after a 5 minute delay the evaporator leaving air temp is higher than setpoint by 2ºF (adj.) and compressor #1 is at 100% capacity, compressor #2 shall start and compressor #1 shall modulate to maintain evaporator leaving air temperature setpoint. Additional compressors shall be brought online in similar fashion as required. The reverse shall occur upon a drop in evaporator leaving air temperature below setpoint with a 5-minute delay between stages. During the dehumidification cycle, the controller shall enable hot gas reheat system which shall modulate to maintain discharge air temperature setpoint in accordance with the reset schedule. The hot gas reheat coil shall undergo a purge cycle every 30 minutes for 3 minutes. During the purge cycle the hot gas reheat coil shall be bypassed 100%. Heating mode shall be disabled when dehumidification mode is enabled.
3. Cooling Mode: This mode shall be initiated when outside air temperature downstream of energy recovery wheel is higher than discharge air temperature setpoint by 2ºF (adj.) and outside air dew-point downstream of energy recovery is below 48ºF (adj.). Compressor #1 shall start and modulate to maintain discharge air temperature setpoint in accordance with reset schedule. If after a 5 minute delay the discharge air temperature is higher than the discharge air temperature setpoint by two 2ºF (adj.) and compressor #1 is at 100% capacity, compressor #2 shall start and compressor #1 shall modulate to maintain discharge air temperature setpoint. Additional compressors shall be brought online in similar fashion as required. The reverse shall occur upon a drop in discharge air temperature below setpoint with a 5 minute delay between stages. Heating mode shall be disabled when cooling mode is enabled.
4. Energy Recovery - Economizer Mode: This mode shall be initiated when the outside air dew-point entering the unit is within +/– 2.5ºF of the return air dew-point. Energy recovery wheel shall stop and jog every 5 minutes (adj.) to keep clean.
5. Energy Recovery – Frost Protection Mode: This mode shall be initiated when the exhaust air temperature leaving the energy recovery wheel drops below the frost control temperature setpoint as determined by unit manufacturer. Energy recovery wheel VFD shall modulate speed to maintain frost control temperature setpoint. Systems using electric preheat shall energize heating coil upstream of energy recovery wheel to prevent frost formation. Energy recovery wheel shall jog every 5 minutes (adj.) to keep clean. .

F. Unoccupied Periods

1. Unit Start: Upon start sequence initiation, outside air and exhaust air dampers shall remain closed and return air damper shall remain open and prove open. The supply fan shall start and run at minimum speed. The energy recovery wheel and exhaust fan shall remain off. After a 30-second (adj.) delay, the supply fan shall run at predetermined speed necessary to achieve design airflow. The BAS contractor shall coordinate with the balancing contractor in order to establish speed set point necessary to obtain the required airflow rate.
2. Dehumidification Mode: A relative humidity sensor located in one of the classrooms served by the unit shall monitor space relative humidity levels. Unit shall start and enter mode when space relative humidity rises above 55% (adj.). Cooling system operation shall be the same as for occupied dehumidification mode. Dehumidification mode shall cease when space relative humidity drops 5% below setpoint.
3. Heating Mode: Unit shall start and enter mode when 2 (adj.) or more zones drop 2ºF below unoccupied heating setpoint. Zone heating coil valves shall open to achieve a zone temperature 2ºF above unoccupied heating setpoint. Cooling mode shall be disabled when heating mode is enabled. Heating mode shall cease when zone heating demands are satisfied.

G. Discharge Air Temperature Reset

1. Outside Air Temperature Reset: The discharge air temperature setpoint shall reset between 55ºF and 65ºF as follows:

   a. The discharge air temperature setpoint shall be 65°F when outside air temperature is below 40°F.
   b. As outside air temperature rises from 40°F to 70°F, the discharge air temperature setpoint shall reset downwards from 65°F to 55°F.
   c. The discharge air temperature setpoint shall be 55°F when outside air temperature is above 70°F.

H. Safeties: The following hard-wired safeties shall shutdown unit and generate an alarm.

1. Fire Alarm System: Unit shall shutdown upon activation of building fire alarm system. Electrical Contractor shall provide fire alarm system control module. BAS Contractor shall hardwire through control module to shut down unit. Unit shall resume normal operation automatically upon manual reset through the fire alarm system.
2. Smoke Detectors: Unit shall shutdown upon activation of unit mounted smoke detectors. Rooftop unit manufacturer shall provide smoke detector within unit supply air and unit return air plenums. BAS Contractor shall hardwire through smoke detectors to shutdown unit. Unit shall resume normal operation automatically when smoke condition clears.
3. Freezestat: Unit shall shutdown upon activation of low temperature switch (freezestat). BAS Contractor shall provide double pole, low limit temperature switch with sensing bulb in supply air duct main. Switch shall trip when any one foot section of the sensing element drops below 38°F. One pole shall be hardwired to shut down unit and the other pole shall be used to provide status to BAS. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
4. Supply Air High Static: Unit shall shutdown upon activation of high static pressure switch. BAS Contractor shall provide a double pole, pressure switch to sense static pressure within the supply air duct main. Switch shall trip when pressure set point is exceeded. One pole shall be hardwired to shut down unit and the other pole shall be used to provide status to BAS. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
5. Return Air Low Static: Unit shall shutdown upon activation of low static pressure switch. BAS Contractor shall provide a double pole, pressure switch to sense static pressure within the return air duct main. Switch shall trip when pressure set point is exceeded. One pole shall be hardwired to shut down unit and the other pole shall be used to provide status to BAS. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.

I. Alarms: The following shall generate and alarm.

1. Dirty Filter (Each Filter): Alarm shall be generated if filter differential pressure switch trips. Rooftop unit manufacturer shall provide pressure switch for each filter bank. Adjust switch setting per filter manufacturer's recommendations.
2. Supply Fan Runtime Exceeded: Alarm shall be generated if runtime hours exceed a user definable limit (adj.). BAS shall monitor supply fan runtime through BACnet interface. Runtime hours shall be resettable through BAS.
3. Supply Fan Failure: Alarm shall be generated upon fan failure. BAS shall monitor failure status through BACnet interface.
4. Exhaust Fan Runtime Exceeded: Alarm shall be generated if runtime hours exceed a user definable limit (adj.). BAS shall monitor supply fan runtime through BACnet interface. Runtime hours shall be resettable through BAS.
5. Exhaust Fan Failure: Alarm shall be generated upon fan failure. BAS shall monitor failure status through BACnet interface.

6. Energy Recovery Wheel Runtime Exceeded: Alarm shall be generated if runtime hours exceed a user definable limit (adj.). BAS shall monitor supply fan runtime through BACnet interface. Runtime hours shall be resettable through BAS.
7. Energy Recovery Wheel Failure: Alarm shall be generated upon energy recovery wheel failure. BAS shall monitor failure status through BACnet interface.
8. Temperature and Relative Humidity Sensor Failure: Alarm shall be generated upon failure of any sensor. BAS shall monitor sensors through BACnet interface.
9. Low Space Temperature: Alarm shall be indicated if space temperature is less than 55ºF (adj.). BAS shall monitor sensor through BACnet interface.
10. High Space Temperature: Alarm shall be generated if space temperature is greater than 85ºF (adj.). BAS shall monitor sensor through BACnet interface.
11. High Space Relative Humidity: Alarm shall be indicated if space relative humidity is greater than 65% (adj.). BAS shall monitor sensor through BACnet interface.

J. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Outside Air Temp (Global)	x								x		x
Outside Air Relative Humidity (Global)	x								x		x
Freezestat			x							x	x
Supply Air High Static			x							x	x
Return Air Low Static			x							x	x
Rooftop Unit Occupied/Unoccupied			x						x		x
Average Space Temperature					x				x		x
POINTS ACCESSIBLE VIA BACNET INTERFACE											
Outside Air Temp	x								x		x
Outside Air Relative Humidity	x								x		x
Space Temperature	x								x	x	x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Space Relative Humidity	x								x	x	x
Energy Recovery Wheel Leaving Air Temp (Supply Air)	x								x		x
Energy Recovery Wheel Leaving Air Relative Humidity (Supply Air)	x								x		x
Discharge Air Temp	x								x		x
Evaporator Leaving Air Temp	x								x		x
Hot Gas Reheat Command		x							x		x
Supply Fan VFD Command		x							x		x
Exhaust Fan VFD Command		x							x		x
Comp #1 Command (Digital Scroll)		x							x		x
Supply Fan Status			x							x	x
Exhaust Fan Status			x							x	x
Filter Status (Each Filter)			x							x	x
Emergency Stop			x							x	x
Occupancy Input			x								x
OA Damper End Switch			x								x
Supply Fan Start/Stop Command				x							x
Exhaust Fan Start/Stop Command				x							x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
OA Damper Command				x							x
Heating Demand				x							x
Comp #1 Command				x							x
Comp #2 Command				x							x
Comp #3 Command				x							x
Comp #4 Command				x							x
Energy Recovery Wheel Command				x							x
Occupied Space Cooling Setpoint					x						x
Occupied Space Heating Setpoint					x						x
Discharge Air Temperature BAS					x						x
Space Relative Humidity BAS					x						x
Outdoor Air Dewpoint Setpoint					x						x
Evaporator Leaving Air Temperature Setpoint					x						x
Space Temperature BAS					x						x
Unoccupied Space Cooling Setpoint					x						x
Unoccupied Space Heating Setpoint					x						x
Unoccupied Space Dewpoint Setpoint					x						x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Outdoor Air Cooling Setpoint					x						x
Discharge Air Cooling Setpoint					x						x
Discharge Air Heating Setpoint					x						x
Outdoor Air Heating Setpoint					x						x
Space Dewpoint Setpoint					x						x
Supply Fan VFD Setpoint					x						x
Exhaust Fan VFD Setpoint					x						x
Supply Airflow					x						x
Exhaust Airflow					x						x
Outdoor Air Temperature BAS					x						x
Outdoor Air Relative Humidity BAS					x						x
Minimum Discharge Air Cooling Setpoint					x						x
Minimum Discharge Air Heating Setpoint					x						x
Supply Fan Failure							x			x	x
Exhaust Fan Failure							x			x	x
Diagnostic: OA Damper Proving Switch							x				x
Diagnostic: Discharge Air Temperature Source Failure							x			x	x
Economizer Mode							x				x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Diagnostic: Space Temperature Source Failure							x			x	x
Diagnostic: Outdoor Air Temperature Source Failure							x			x	x
Diagnostic: Outdoor Air Relative Humidity Source Failure							x			x	x
Alarm Reset							x				
System Lockout							x			x	x
Diagnostic: Space Relative Humidity Source Failure							x			x	x
Unoccupied Cooling Mode							x				x
Unoccupied Dehumidification Mode							x				x
Cool Stage 1 Request							x				x
Cool Stage 2 Request							x				x
Cool Stage 3 Request							x				x
Cool Stage 4 Request							x				x
Dehumidification Command							x				x
Program Control							x				
Occupancy Request							x				x

4.07 PACKAGED ROOFTOP DEHUMIDIFICATION UNITS (DHU-6A)

A. General

1. A packaged control system shall be provided by the rooftop unit manufacturer. The packaged control system shall include the following features:

   a. Standalone microprocessor controls with local display and BACnet connection for BAS interface.
   b. All control devices mounted and wired except for devices required to be remotely mounted. These devices to be factory furnished and field installed by BAS Contractor.
   c. BACnet communication protocol to end devices.
   d. Clock and scheduling function for occupancy with separate occupied and unoccupied setpoints. Scheduling shall be through the BAS with backup provided by integral time clock upon loss of communication with BAS.
   e. Non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
   f. Supply fan with motor protection devices and variable frequency drives.
   g. Dampers and damper actuators.
   h. Refrigeration system components.
   i. Anti-cycle timing and minimum equipment run/off times.

2. The BAS shall communicate with the packaged control system using a BACnet interface. In general, the BAS Contractor scope of work shall be:

   a. Overall coordination with rooftop unit manufacturer.
   b. Control wiring for BAS communication and field installed devices.
   c. Programming and set-up of the BAS to send/receive and trend points available through the packaged control system.
   d. Overall commissioning of unit controls including coordination with sub-contractors and unit manufacturer's start-up technician.

3. The rooftop unit shall perform the following functions:

   a. Provide ventilation air and makeup air during occupied mode and operate with 100% return air in unoccupied mode.
   b. Dehumidify, cool and heat supply air prior to delivery to space.

4. Whenever the unit is shut down by command of the control system or power disconnect, all control devices associated with the system shall revert to the normal state or position.
5. After a power interruption, the rooftop unit shall automatically restart in the mode appropriate to the operating schedule.
6. The BAS shall include logic to stagger rooftop unit startups to limit electrical surges.
7. Control device state or position shall be as follows for the various modes of operation:

Mode	Supply Fan	Cooling System	Heating Coil Valve	OA Damper	RA Damper	Exhaust Fan KEF-5
Power Loss	OFF	OFF	OPEN	CLOSED	OPEN	OFF

Mode	Supply Fan	Cooling System	Heating Coil Valve	OA Damper	RA Damper	Exhaust Fan KEF-5
Unoccupied	OFF	OFF	CLOSED	CLOSED	OPEN	OFF
Unoccupied Dehum.	ON	ON & MOD	CLOSED	CLOSED	OPEN	OFF
Unoccupied Night Purge	ON	OFF	CLOSED	OPEN	CLOSED	ON
Unoccupied Heating	ON	OFF	OPEN	CLOSED	OPEN	OFF
Occupied Dehum.	ON	ON & MOD	CLOSED	OPEN	CLOSED	ON
Occupied Cooling	ON	ON & MOD	CLOSED	OPEN	CLOSED	ON
Occupied Heating	ON	OFF	MOD	OPEN	CLOSED	ON

B. Unit Start Initiation

1. The start sequence shall be initiated through one of the following methods:

   a. Enable switch is placed in the “Hand” position at controller.
   b. Enable switch is placed in the “Auto” position at controller and remote BAS enable contacts are closed.

2. The unit shall be commanded to run through the BAS based upon an operator adjustable schedule or when any associated exhaust fans is energized (KEF-4, 5 or 6) or there is a zone heating or dehumidification demand. Upon loss of BAS communications, unit shall run based upon time clock provided with packaged controls.
3. In addition, the following control method shall be available for operator selection:

   a. Local Override: The unit shall run for 2 hours (adj.) upon activation of override at any zone.

C. Optimal Start

1. The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied setpoints as determined by the BAS. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures.

D. Night Purge Cycle

1. The unit shall start and run in economizer mode during unoccupied periods when conditions are appropriate for night purge cycle. Night purge cycle shall be initiated when

   a. Outside air temperature falls 10ºF (adj.) below average space temperature
   b. AND average space temperature is greater than 70ºF (adj.)
   c. AND outdoor air enthalpy is below 24 btu/lb (adj.)
   d. AND outdoor air temperature is above 50ºF (adj.)

2. Night purge cycle shall stop when

   a. Average space temperature falls to within 5°F (adj.) of outside air temperature
   b. OR average space temperature falls below 70ºF (adj.)
   c. OR outdoor air enthalpy rises above 24 btu/lb (adj.)
   d. OR outdoor air temperature drops below 50ºF (adj.)

3. Heating and cooling mode shall remain off during night purge cycle.

E. Occupied Periods

1. Unit Start and Fan Control: Upon start sequence initiation, the supply fan shall start and run at minimum speed. After a 30-second (adj.) delay, supply fan shall ramp up to predetermined speed to achieve airflow of 1800 CFM, exhaust fan KEF-5 shall start, outside air and return air dampers shall be positioned for minimum outside air of 860 CFM, and the ventilation airflow controls shall be enabled. The BAS contractor shall coordinate with the balancing contractor in order to establish variable frequency drive setpoint and damper positions necessary to obtain the required airflows. The following two ventilation airflow control methods shall be available for operator selection:

   a. Method #1 Predetermined Speed/Positions: The supply fan shall run at predetermined speed and the outside air and return air dampers shall be positioned to achieve design airflows based on the status of associated exhaust fans as follows:

KEF-4 STATUS	KEF-5 STATUS	KEF-6 STATUS	KEF TOTAL CFM	SUPPLY CFM	O/A CFM	R/A CFM	NEG. PRESS. CFM
OFF	ON	OFF	1260	1800	860	940	400
OFF	ON	ON	3250	2850	2850	0	400
ON	ON	OFF	4020	3620	3620	0	400
ON	ON	ON	6010	5610	5610	0	400

   b. Method #2 (Static Pressure Control): Control shall be enabled whenever KEF-4 or KEF-5 is energized. Upon activation, the supply fan shall modulate to maintain a space static pressure setpoint of negative 0.05 inches w.g. (adj.). Outside air and return air dampers shall be positioned for 100% outside air.
   c. Airflow stations shall be factory installed in unit to measure supply airflow and outside airflow. The air flow stations shall be used to measure the air entering and leaving the system during operation. The BAS contractor shall coordinate with the balancing contractor in order to calibrate air flow stations.

2. Dehumidification Mode: This mode shall be initiated when outside air dew-point is above 48ºF (adj.) and the space relative humidity is above 50% (adj.). Compressor #1 shall start and modulate to maintain evaporator leaving air temperature setpoint of 48ºF (adj.). If after a 5 minute delay the evaporator leaving air temp is higher than setpoint by 2ºF (adj.) and compressor #1 is at 100% capacity, compressor #2 shall start and compressor #1 shall modulate to maintain evaporator leaving air temperature setpoint. Additional compressors shall be brought online in similar fashion as required. The reverse shall occur upon a drop in evaporator leaving air temperature below setpoint with a 5-minute delay between stages. During the dehumidification cycle, the controller shall enable hot gas reheat system which shall modulate to maintain the space air temperature heating setpoint. The hot gas reheat coil shall undergo a purge cycle every 30 minutes for 3 minutes. During the purge cycle the hot gas reheat coil shall be bypassed 100%. Cooling mode shall be disabled when dehumidification mode is enabled.
3. Cooling Mode: This mode shall be initiated when outside air temperature is above 55ºF (adj.), space air temperature is above 75ºF (adj.) and there is no dehumidification demand. Compressor #1 shall start and modulate to maintain discharge air temperature of 57ºF (adj.). If after a 5 minute delay the discharge air temperature is higher than the discharge air temperature setpoint by two 2ºF (adj.) and compressor #1 is at 100% capacity, compressor #2 shall start and compressor #1 shall modulate to maintain discharge air temperature setpoint. Additional compressors shall be brought online in similar fashion as required. The reverse shall occur upon a drop in discharge air temperature below setpoint with a 5 minute delay between stages. Cooling mode shall cease when space air temperature setpoint is 2ºF below setpoint. Heating mode shall be disabled when cooling mode is enabled. Provide minimum 5ºF differential between space heating and cooling temperature setpoints.
4. Heating Mode: This mode shall be initiated when outside air temperature is below 65ºF and space air temperature is below 70ºF (adj.). Heating coil valve shall modulate to maintain discharge air temperature setpoint which shall be reset from 65ºF to 95ºF based on space temperature. Cooling mode shall be disabled when heating mode is enabled. Provide minimum 5ºF differential between space heating and cooling temperature setpoints.

F. Unoccupied Periods

1. Unit Start: Upon start sequence initiation, outside air damper shall remain closed and return air damper shall remain open. The supply fan shall start and run at minimum speed. Exhaust fan KEF-5 shall remain off. After a 30-second (adj.) delay, the supply fan shall run at predetermined speed necessary to achieve airflow of 1800 CFM. The BAS contractor shall coordinate with the balancing contractor in order to establish speed set point necessary to obtain the required airflow rate.
2. Dehumidification Mode: A relative humidity sensor located in space served by the unit shall monitor space relative humidity levels. Unit shall start and enter mode when space relative humidity rises above 55% (adj.). Cooling system operation shall be the same as for occupied dehumidification mode. Dehumidification mode shall cease when space relative humidity drops 5% below setpoint.
3. Heating Mode: Unit shall start and enter mode when space drops 2ºF below unoccupied heating setpoint. Unit heating coil valve shall open to achieve a zone temperature 2ºF above unoccupied heating setpoint. Cooling mode shall be disabled when heating mode is enabled. Heating mode shall cease when space heating demand is satisfied.

G. Safeties: The following hard-wired safeties shall shutdown unit and generate an alarm.

1. Fire Alarm System: Unit shall shutdown upon activation of building fire alarm system. Electrical Contractor shall provide fire alarm system control module. BAS Contractor shall hardwire through control module to shut down unit. Unit shall resume normal operation automatically upon manual reset through the fire alarm system.
2. Smoke Detectors: Unit shall shutdown upon activation of unit mounted smoke detector. Rooftop unit manufacturer shall provide smoke detector within unit supply air plenum. BAS

Contractor shall hardwire through smoke detector to shutdown unit. Unit shall resume normal operation automatically when smoke condition clears.

3. Freezestat: Unit shall shutdown upon activation of low temperature switch (freezestat). BAS Contractor shall provide double pole, low limit temperature switch with sensing bulb in supply air duct main. Switch shall trip when any one foot section of the sensing element drops below 38°F. One pole shall be hardwired to shut down unit and the other pole shall be used to provide status to BAS. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
4. Supply Air High Static: Unit shall shutdown upon activation of high static pressure switch. BAS Contractor shall provide a double pole, pressure switch to sense static pressure within the supply air duct main. Switch shall trip when pressure set point is exceeded. One pole shall be hardwired to shut down unit and the other pole shall be used to provide status to BAS. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
5. Return Air Low Static: Unit shall shutdown upon activation of low static pressure switch. BAS Contractor shall provide a double pole, pressure switch to sense static pressure within the return air duct main. Switch shall trip when pressure set point is exceeded. One pole shall be hardwired to shut down unit and the other pole shall be used to provide status to BAS. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.

H. Alarms: The following shall generate and alarm.

1. Dirty Filter: Alarm shall be generated if filter differential pressure switch trips. Rooftop unit manufacturer shall provide pressure switch for filter bank. Adjust switch setting per filter manufacturer's recommendations.
2. Supply Fan Runtime Exceeded: Alarm shall be generated if runtime hours exceed a user definable limit (adj.). BAS shall monitor supply fan runtime through BACnet interface. Runtime hours shall be resettable through BAS.
3. Supply Fan Failure: Alarm shall be generated upon fan failure. BAS shall monitor failure status through BACnet interface.
4. Exhaust Fan KEF-5 Runtime Exceeded: Alarm shall be generated if runtime hours exceed a user definable limit (adj.). BAS shall monitor supply fan runtime. Runtime hours shall be resettable through BAS.
5. Exhaust Fan KEF-5 Failure: Alarm shall be generated when fan is commanded on, but status is off.
6. Temperature and Relative Humidity Sensor Failure: Alarm shall be generated upon failure of any sensor. BAS shall monitor sensors through BACnet interface.
7. Low Space Temperature: Alarm shall be indicated if space temperature is less than 55ºF (adj.). BAS shall monitor sensor through BACnet interface.
8. High Space Temperature: Alarm shall be generated if space temperature is greater than 85ºF (adj.). BAS shall monitor sensor through BACnet interface.
9. High Space Relative Humidity: Alarm shall be indicated if space relative humidity is greater than 65% (adj.). BAS shall monitor sensor through BACnet interface.

I. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Outside Air Temp (Global)	x								x		x
Outside Air Relative Humidity (Global)	x								x		x
Freezestat			x							x	x
Supply Air High Static			x							x	x
Return Air Low Static			x							x	x
Exhaust Fan KEF-4 Status			x								x
Exhaust Fan KEF-5 Status			x							x	x
Exhaust Fan KEF-6 Status			x								x
Exhaust Fan KEF-5 On/Off				x					x		x
Rooftop Unit Occupied/Unoccupied				x					x		x
POINTS ACCESSIBLE VIA BACNET INTERFACE											
Outside Air Temp	x								x		x
Outside Air Relative Humidity	x								x		x
Space Temperature	x								x	x	x
Space Relative Humidity	x								x	x	x
Discharge Air Temp	x								x		x
Evaporator Leaving Air Temp	x								x		x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Hot Gas Reheat Command		x							x		x
Supply Fan VFD Command		x							x		x
Comp #1 Command (Digital Scroll)		x							x		x
Heating Output Command		x							x		x
Supply Fan Status			x							x	x
Filter Status			x							x	x
Emergency Stop			x							x	x
Occupancy Input			x								x
OA Damper End Switch			x								x
Supply Fan Start/Stop Command				x							x
OA Damper Command				x							x
Heating Demand				x							x
Comp #1 Command				x							x
Comp #2 Command				x							x
Comp #3 Command				x							x
Comp #4 Command				x							x
Occupied Space Cooling Setpoint					x						x
Occupied Space Heating Setpoint					x						x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Discharge Air Temperature BAS					x						x
Space Relative Humidity BAS					x						x
Outdoor Air Dewpoint Setpoint					x						x
Evaporator Leaving Air Temperature Setpoint					x						x
Space Temperature BAS					x						x
Unoccupied Space Cooling Setpoint					x						x
Unoccupied Space Heating Setpoint					x						x
Unoccupied Space Dewpoint Setpoint					x						x
Outdoor Air Cooling Setpoint					x						x
Discharge Air Cooling Setpoint					x						x
Discharge Air Heating Setpoint					x						x
Outdoor Air Heating Setpoint					x						x
Space Dewpoint Setpoint					x						x
Supply Fan VFD Setpoint					x						x
Supply Airflow					x						x
Outdoor Air Temperature BAS					x						x
Outdoor Air Relative Humidity BAS					x						x
Minimum Discharge Air Cooling					x						x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Setpoint											
Minimum Discharge Air Heating Setpoint					x						x
Supply Fan Failure							x			x	x
Diagnostic: Discharge Air Temperature Source Failure							x			x	x
Diagnostic: Space Temperature Source Failure							x			x	x
Diagnostic: Outdoor Air Temperature Source Failure							x			x	x
Diagnostic: Outdoor Air Relative Humidity Source Failure							x			x	x
Alarm Reset							x				
System Lockout							x			x	x
Diagnostic: Space Relative Humidity Source Failure							x			x	x
Unoccupied Cooling Mode							x				x
Unoccupied Heating Mode							x				x
Unoccupied Dehumidification Mode							x				x
Cool Stage 1 Request							x				x
Cool Stage 2 Request							x				x
Cool Stage 3 Request							x				x
Cool Stage 4 Request							x				x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Dehumidification Command							x				x
Program Control							x				
Occupancy Request							x				x

4.02 PACKAGED ROOFTOP AIR CONDITIONING UNITS (AHU)

A. General

1. A packaged control system shall be provided by the rooftop air handling unit manufacturer. The packaged control system shall include the following features:

   a. Standalone microprocessor controller with BACnet interface for BAS connection.
   b. All control devices mounted and wired except for devices required to be remotely mounted. These devices to be factory furnished and field installed by BAS Contractor.
   c. BACnet communication protocol to end devices.
   d. Clock and scheduling function for occupancy with separate occupied and unoccupied setpoints. Scheduling shall be through the BAS with backup provided by integral time clock upon loss of communication with BAS.
   e. Non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
   f. Fans, motor protection devices and variable frequency drives.
   g. Dampers and damper actuators.
   h. Refrigeration system components.
   i. Anti-cycle timing and minimum equipment run/off times.

2. The BAS shall communicate with the packaged control system using a BACnet interface. In general, the BAS Contractor scope of work shall be:

   a. Overall coordination with energy recovery unit manufacturer.
   b. Control wiring for BAS communication and field installed devices.
   c. Programming and set-up of the BAS to send/receive and trend points available through the packaged control system.
   d. Overall commissioning of unit controls including coordination with sub-contractors and unit manufacturer's start-up technician.

3. Whenever the unit is shut down by command of the control system or power disconnect, all control devices associated with the system shall revert to the normal state or position. All two-position control dampers and valves shall be equipped with end switches to prove position. All modulating control dampers and valves shall be equipped to provide position indicating feedback.
4. After a power interruption, the air handling system shall automatically restart in the mode appropriate to the operating schedule.

5. The BAS shall include logic to stagger equipment startups to limit electrical surges.
6. Control device state or position shall be as follows for the various modes of operation:

Mode	Supply Fan	Exhaust Fan	Heating Coil Valve	Cooling System	OA Damper	EA Damper	RA Damper
Power Loss	OFF	OFF	FAIL OPEN	OFF	CLOSED	CLOSED	OPEN
Unoccupied	OFF	OFF	CLOSED	OFF	CLOSED	CLOSED	OPEN
Unoccupied Dehum.	ON	OFF	CLOSED	ON & MOD	CLOSED	CLOSED	OPEN
Unoccupied Heating	ON	OFF	OPEN & MOD	OFF	CLOSED	CLOSED	OPEN
Occupied Dehum.	ON	ON	CLOSED	ON & MOD	MOD	OPEN	MOD
Occupied Cooling	ON & MOD	ON & MOD	CLOSED	ON & MOD	MOD	OPEN	MOD
Occupied Heating	ON & MOD	ON & MOD	OPEN & MOD	OFF	MOD	OPEN	MOD
Economizer	ON & MOD	ON & MOD	OFF	TBD	MOD	OPEN	MOD

B. Run Conditions

1. The unit shall be commanded to run through the BAS based upon an operator adjustable schedule or when a definable number of unoccupied zones need heating, cooling, OR dehumidification. Upon loss of BAS communications, unit shall run based upon time clock provided with packaged controls.
2. In addition, the following control method shall be available for operator selection:

   a. Local Override: The unit shall run for 2 hours (adj.) upon activation of override at any zone.

C. Optimal Start

1. The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied setpoints as determined by the BAS. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures. Minimum outside air ventilation control shall be disabled during Optimal Start period, but economizer control shall be enabled to allow free cooling when available.

D. Supply Fan Start

1. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
2. Upon unit start the supply fan shall start and run at minimum speed. After a 30 second delay, the supply fan static pressure controls shall be enabled.

E. Supply Fan Static Pressure Controls

1. The controller shall measure duct static pressure and modulate the supply fan VFD speed to maintain duct static pressure setpoint as determined by the BAS. The supply fan VFD speed shall not drop below 25%.
2. The static pressure sensor shall be located in the supply air duct approximately 2/3 of the distance downstream in the longest medium pressure duct main. The BAS contractor shall coordinate with the balancing contractor in order to establish the static pressure setpoint necessary to obtain the maximum design airflow rate at the lowest possible fan speed. The setpoint established shall be used as the upper limit or SPmax in the static pressure reset range.
3. Static Pressure Reset: The static pressure setpoint shall be reset based on zone cooling demand using trim & respond logic within the range of 0.25 inches to SPmax. When the fan is off, the setpoint shall be reset to 0.5 inches w.g. While the fan is proven on, every two minutes, trim the setpoint by 0.04 inches w.g. if there are two or fewer zone pressure requests. If there are more than two zone pressure requests, respond by increasing the setpoint by 0.06 inches w.g. A zone pressure request is generated when the air terminal unit damper is greater than 95% open until it drops to 85% open.

F. Supply Air Temperature Reset

1. The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint as determined by the BAS based on outside air temperature.
2. Outside Air Temperature Reset: The supply air temperature setpoint shall reset as follows:

    a. The supply air temperature setpoint shall be 60°F when outside air temperature is below 50°F.
    b. As outside air temperature rises from 50°F to 80°F, the supply air temperature setpoint shall reset downwards from 60°F to 55°F.
    c. The supply air temperature setpoint shall be 55°F when outside air temperature is above 80°F.

3. Temporary Warm-up: If the return air temperature drops below 60°F and the outside air temperature is below 50°F, then the supply air temperature setpoint shall be 70°F until return air temperature rises above 65°F.

G. Heating

1. The controller shall measure the supply air temperature, activate heating and sequentially stage and modulate compressors to maintain its heating setpoint. Heating shall be enabled whenever:

    a. Outside air temperature is less than 60°F.
    b. AND the supply fan status is on.
    c. AND the cooling is not active.

H. Cooling and Dehumidification

1. The controller shall measure the supply air temperature, activate cooling and sequentially stage and modulate compressors to maintain its cooling setpoint. Cooling shall be enabled whenever:

a. Outside air temperature is greater than 60°F.
b. AND the economizer is disabled or fully open.
c. AND the supply fan status is on.
d. AND the heating is not active.

2. The controller shall measure the return air relative humidity and activate dehumidification if return air relative humidity rises above 55%. Supply air temperature setpoint shall be 55ºF during dehumidification mode.

I. Minimum Outside Air Ventilation

1. Fixed Outside Air Ventilation: When in the occupied mode, the controller shall measure the outside airflow and modulate the outside air, return air and exhaust air dampers to maintain the scheduled minimum outside air ventilation rate.

J. Exhaust Fan Airflow Control: The following two control methods shall be available for operator selection:

1. Method #1 (Airflow Tracking): The controller shall monitor the exhaust airflow and modulate the exhaust fan VFD to maintain exhaust airflow setpoint as determined by the BAS. The exhaust airflow setpoint shall be 90% of the outside airflow minus local exhaust airflow. The BAS shall monitor status of exhaust fans to determine local exhaust airflow. The exhaust fan VFD speed shall not drop below 25%. If the average building static pressure deviates more than a definable percentage (to be determined in field based on building conditions) from setpoint, Method #2 shall automatically be enabled.
2. Method #2 (Building Static Pressure Control): The BAS shall measure building static pressure in area served and reset exhaust airflow setpoint to maintain a building static pressure of +0.05 inches w.g. The exhaust fan VFD speed shall not drop below 25%. The exhaust fan shall shutdown if building static pressure drops below a definable amount (to be determined in field based on building conditions).
3. To prevent short cycling, the exhaust fan shall have a user definable (adj.) minimum runtime.

K. Economizer

1. The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F less than the supply air temperature setpoint.
2. The economizer shall be enabled whenever:

   a. Outside air temperature is less than 65°F.
   b. AND the outside air enthalpy is less than 22 Btu/lb.
   c. AND the outside air temperature is less than the return air temperature.
   d. AND the outside air enthalpy is less than the return air enthalpy.
   e. AND the supply fan status is on.

3. The economizer shall close whenever:

   a. Mixed air temperature drops below 40°F.
   b. OR the low temperature switch (freezestat) trips.
   c. OR on loss of supply fan status.

4. The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If Optimal Start is available the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

L. Safeties: The unit shall shut down and generate an alarm upon the following conditions.

1. Fire Alarm Shutdown: Upon receiving an emergency shutdown signal from the fire alarm system. Associated duct mounted smoke detectors shall send supervisory signal to fire alarm system. Fire alarm system shall initiate unit shut-down through local control module. Unit shall resume normal operation automatically upon manual reset through the fire alarm system.
2. Freeze Protection: Low temperature switch (freezestat) trips. Provide a double pole, low limit temperature switch with sensing bulb on the discharge side of the heating coil. Switch shall trip when any one foot section of the sensing element drops below 38°F. One pole shall be hardwired to stop the supply and exhaust fans, close the outside air damper, close the exhaust air damper, and open the return air damper. The other pole shall be used to provide status to unit controller. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
3. High Static: High static pressure switch trips. Provide a double pole, pressure switch to sense static pressure within the main supply air duct. Switch shall trip when pressure set point is exceeded. One pole shall be hardwired to stop the supply and exhaust fans. The other pole shall be used to provide status to unit controller. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
4. Low Static: Low static pressure switch trips. Provide a double pole, pressure switch to sense static pressure within the main return air duct. Switch shall trip when pressure set point is exceeded. One pole shall be hardwired to stop the supply and exhaust fans. The other pole shall be used to provide status to unit controller. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
5. Supply Fan Prove: If the differential pressure switch doesn't prove the supply fan is on 60 second (adj.) after commanded to run, the controller shall shutdown unit. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.
6. Exhaust Fan Prove: If the differential pressure switch doesn't prove the exhaust fan is on 60 second (adj.) after commanded to run, the controller shall shutdown unit. Unit shall resume normal operation automatically upon manual reset remotely through the BAS.

M. Alarms: Alarms shall be provided as follows.

1. Supply Fan Failure: Commanded on, but the status is off.
2. Supply Fan in Hand: Commanded off, but the status is on.
3. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).
4. Supply Fan VFD Alarm/Fault.
5. Exhaust Fan Failure: Commanded on, but the status is off.
6. Exhaust Fan in Hand: Commanded off, but the status is on.
7. Exhaust Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).
8. Exhaust Fan VFD Alarm/Fault.
9. High Supply Air Static Pressure: If the supply air static pressure is 25% greater than setpoint.
10. Low Supply Air Static Pressure: If the supply air static pressure is 25% less than setpoint.
11. High Building Static Pressure: If the building air static pressure is 25% greater than setpoint.
12. Low Building Static Pressure: If the building air static pressure is 25% less than setpoint.
13. High Exhaust Airflow: If the return airflow is an adjustable percentage greater than setpoint.
14. Low Exhaust Airflow: If the return airflow is an adjustable percentage less than setpoint.
15. High Supply Air Temp: If the supply air temperature is 5°F greater than setpoint.
16. Low Supply Air Temp: If the supply air temperature is 5°F less than setpoint.
17. Filter differential pressure exceeds a user definable limit.
18. Low Mixed Air Temp: If the mixed air temperature is less than 45°F.
19. High Return Air Humidity: If the return air humidity is greater than 70%.
20. High Return Air Temp: If the return air temperature is greater than 90°F.
21. Low Return Air Temp: If the return air temperature is less than 50°F.

N. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Outside Air Temp	x								x		x
Outside Air Humidity	x								x		x
Building Static Pressure – Area Served	x								x	x	x
Rooftop Unit Start/Stop				x					x		x
Supply Fan Start/Stop				x					x		x
Exhaust Fan Start/Stop				x					x		x
Outside Air Damper		x							x		x
Return Air Damper		x							x		x
Exhaust Air Damper		x							x		x
Compressor Start/Stop (Each)				x					x		x
Lead Compressor Speed		x							x		x
Supply Air Temp	x								x	x	x
Supply Airflow	x								x		x
Supply Air Static Pressure	x								x	x	x
Mixed Air Temp	x								x		x
Return Air Temp	x								x	x	x
Return Air Humidity	x								x	x	x
Return Airflow	x								x		x
Outside Airflow	x								x		x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Exhaust Airflow	x								x		x
Outside Air Damper Position	x								x		x
Return Air Damper Position	x								x		x
Exhaust Air Damper Position	x								x		x
Supply Fan Speed		x							x		x
Exhaust Fan Speed		x							x		x
Filter Differential Press	x								x	x	x
Supply Air High Static			x							x	x
Freezestat			x							x	x
Return Air Low Static			x							x	x
Supply Fan Run Status			x						x		x
Supply Fan Alarm/Fault			x							x	x
Exhaust Fan Run Status			x						x		x
Exhaust Fan Alarm/Fault			x							x	x
Heating Mode Status							x		x		x
Cooling Mode Status							x		x		x
Dehumidification Mode Status							x		x		x
Compressor Status (Each)			x						x		x

4.03 SINGLE DUCT AIR TERMINAL UNIT (VV, CV)

A. General:

1. Air terminal unit shall be controlled independent of system pressure fluctuations by an application specific controller using electric actuation. The controller and damper actuator shall be provided by BAS Contractor and factory installed within an electrical enclosure provided the equipment manufacturer. Damper actuator shall be of the true analog type. Tri-state actuator may be used in lieu of analog type if damper positioning feedback is provided.
2. Air terminal unit shall operate whenever the associated air handling unit is operating. Controller shall modulate damper position, reheat coil valve, and associated perimeter radiation valve (as applicable) in sequence to maintain setpoint.
3. Separate space temperature setpoints shall be provided for occupied and unoccupied periods.
4. Normal control device state or position shall be as follows:

    a. Damper shall be last position
    b. Reheat valve shall be last position

B. Run Conditions

1. The unit shall run based upon an operator adjustable schedule in the following modes:

    a. Occupied Mode: The unit shall maintain a 78°F cooling setpoint and a 68°F heating setpoint.
    b. Unoccupied Mode (night setback): The unit shall maintain an 85°F cooling setpoint and a 55°F heating setpoint.

C. Demand Control Ventilation (where CO2 sensors are shown)

1. When in the occupied mode, the controller shall measure the zone CO2 levels and modulate the zone damper open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of not more than 900 ppm.

D. Zone Optimal Start

1. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

E. Reversing Airflow Control

1. Occupied Mode:

    a. The controller shall measure the zone temperature. When zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum and maximum airflow setpoints to maintain the zone temperature cooling setpoint.
    b. When the zone temperature is between the cooling and heating setpoints, the zone damper shall maintain the minimum airflow.
    c. When zone temperature is less than its heating setpoint, the controller shall enable heating to maintain the zone temperature heating setpoint.

2. Unoccupied Mode:

   a. The controller shall measure the zone temperature. When zone temperature is greater than its unoccupied cooling setpoint, the associated air handling unit shall run and the zone damper shall modulate between the minimum and maximum airflow setpoints to achieve a zone temperature 5°F below the unoccupied cooling setpoint. Air handling unit shall continue to run until all zones are satisfied.
   b. When the zone temperature is between the cooling and heating unoccupied setpoints, the zone damper shall maintain the minimum airflow.
   c. When zone temperature is less than its heating setpoint, the controller shall enable heating to maintain the zone temperature unoccupied heating setpoint.

F. Reheat Coil and Perimeter Heating Valves

1. Occupied Mode:

   a. The controller shall measure the zone temperature and modulate the reheat coil valve in unison with the perimeter heating valves to maintain the zone temperature heating setpoint.
   b. The controller shall limit reheat coil valve position to maintain a discharge air temperature less than 15°F above the zone temperature.

2. Unoccupied Mode:

   a. The controller shall measure the zone temperature and modulate the perimeter heating valves to maintain the zone temperature unoccupied heating setpoint. Upon a drop of 2°F below the unoccupied heating setpoint, the associated air handling unit shall run and the reheat coil valve shall modulate in unison with the perimeter heating valves. Air handling unit shall continue to run until all zones are satisfied.
   b. The controller shall limit reheat coil valve position to maintain a discharge air temperature less than 15°F above the zone temperature.

G. Alarms shall be provided as follows:

1. High Space Carbon Dioxide Concentration: If CO2 concentration is greater than 1100 ppm.
2. Low Space Temp: If the space temperature is lower than the heating setpoint by 5°F for more than 15 minutes.
3. High Space Temp: If the space temperature is higher than the cooling setpoint by 5°F for more than 15 minutes.

H. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Space Temperature	x								x	x	x
Space Carbon Dioxide PPM	x								x	x	x
Space Setpoint Adjust	x										x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Supply Airflow	x								x		x
Discharge Air Temp	x								x		x
Damper Position		x									x
Reheat Valve Position		x									x
Override Switch			x						x		x
Perimeter Heating Valve Position				x					x		x

4.04 EXHAUST FANS (EF)

A. Run Conditions

1. Exhaust fan shall run based upon an operator adjustable schedule.

B. Exhaust Fan

1. Exhaust fan shall run anytime commanded to run, unless exhaust air damper is closed. To prevent short cycling, the exhaust fan shall have a user definable (adj.) minimum runtime.

C. Exhaust Air Damper

1. Exhaust air damper shall open anytime the exhaust fan is commanded to run and shall close anytime the exhaust fan stops. Exhaust fan shall be enabled after damper status has proven open. The exhaust air damper shall close after exhaust fan stops.

D. Safeties: The unit shall shut down and generate an alarm upon the following conditions:

1. Damper End Switch: Provide double pole end switch to sense position of exhaust air damper. One pole shall be interlocked to stop exhaust fan unless damper is proven open. The other pole shall be used to provide status to BAS.

E. Alarms: Alarms shall be provided as follows.

1. Exhaust Fan Failure: Commanded on, but the status is off.
2. Exhaust Fan in Hand: Commanded off, but the status is on.
3. Exhaust Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

F. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Exhaust Air Damper Status			x								x
Fan Status			x						x	x	x
Fan Start/Stop				x							x

4.05 KITCHEN EXHAUST FANS (KEF)

A. Run Conditions

1. Exhaust fan shall run as controlled locally at hoods.

B. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Fan Status			x						x		x

4.06 FIN TUBE RADIATION AND RADIANT PANEL (FT, RP)

A. General

1. Separate space temperature setpoints shall be provided for occupied and unoccupied periods.
2. Normal control device state or position shall be as follows:

   a. Heating valve shall be normally open.

B. Heating Valve

1. The controller shall measure the space temperature and open the heating valve to maintain its heating setpoint.
2. Heating shall be enabled whenever:

a. Outside air temperature is less than 60°F (adj.).

3. Where indicated on plans by a single sensor controlling multiple terminal devices, the devices shall operate in unison.

C. Alarms shall be provided as follows

1. Low Space Temp: If the space temperature is lower than the heating setpoint by 10°F for more than 15 minutes.

D. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Space Temperature	x								x	x	x
Heating Valve				x					x		x

4.07 CABINET UNIT HEATERS (CUH)

A. General

1. Separate space temperature setpoints shall be provided for occupied and unoccupied periods.
2. Normal control device state or position shall be as follows:

a. Heating valve shall be normally open.

B. Run Conditions

1. The unit shall be enabled to run whenever the outside air temperature drops below 60°F.

C. Fan and Heating Coil

1. The controller shall measure the space temperature and run the fan and open the heating coil valve to maintain its heating setpoint. To prevent short cycling, the fan shall have a user definable minimum runtime.

D. Alarms shall be provided as follows:

1. Low Space Temp: If the space temperature is lower than the heating setpoint by 10°F for more than 15 minutes.
2. Filter Change Required: Filter has been in use for more than 2200 hrs (adj.).

E. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Space Temperature	x								x	x	x
Fan Start/Stop				x					x		x
Heating Coil Valve				x					x		x

4.08 PROPELLER UNIT HEATERS (PUH)

A. General

1. Separate space temperature setpoints shall be provided for occupied and unoccupied periods.
2. Normal control device state or position shall be as follows:

   a. Heating valve shall be normally open.

B. Run Conditions

1. The unit shall be enabled to run whenever the outside air temperature drops below 60°F.

C. Fan and Heating Coil

1. The controller shall measure the space temperature and run the fan and open the heating coil valve to maintain its heating setpoint. To prevent short cycling, the fan shall have a user definable minimum runtime.

D. Alarms shall be provided as follows:

1. Low Space Temp: If the space temperature is lower than the heating setpoint by 10°F for more than 15 minutes.

E. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Space Temperature	x								x	x	x

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Fan Start/Stop				x					x		x
Heating Coil Valve				x					x		x

4.09 AIR CONDITIONING UNITS (AC/ACC)

A. General:

1. Packaged control system shall be provided by the air conditioning equipment manufacturer. The air conditioning units shall be equipped with accessory relays for remote enable/disable and alarm indication.
2. The air conditioning units shall be automatically controlled via dedicated, wall-mounted and wired programmable thermostats provided by the air conditioning equipment manufacturer. The BAS Contractor shall install the thermostat and all control wiring in accordance with the manufacturer's instructions.
3. The BAS Contractor shall connect to enable/disable and alarm relays and provide a separate wall sensor to monitor room temperature.

B. Run Conditions

1. Air conditioning units shall be enabled to run based upon an operator adjustable schedule.

C. Alarms shall be provided as follows:

1. Unit Alarm Indication.
2. Low Space Temp: If the space temperature is lower than 55°F for more than 15 minutes.
3. High Space Temp: If the space temperature is higher than 85°F for more than 15 minutes.

4.10 SUMP PUMP (SP-1, 2)

A. Alarms: Alarms shall be provided as follows.

1. Pump Alarm: Alarm indication at packaged controller.

B. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Alarm Status			x							x	x

4.11 PLUMBING PUMP (PP-1, 2)

A. Run Conditions

1. Pump shall run based upon an operator adjustable schedule.

B. Alarms: Alarms shall be provided as follows.

1. Pump Failure: Commanded on, but the status is off.
2. Pump in Hand: Commanded off, but the status is on.

C. BAS Points List

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AVI	AVO	BVI	BVO	Trend	Alarm	Show On Graphic
Pump Status			x						x	x	x
Pump Start/Stop				x							x

4.12 DUCT MOUNTED HEATING COIL (HC)

A. General:

1. Heating coil shall operate whenever the associated air handling unit is operating. Controller shall modulate coil valve and associated perimeter radiation valve (as applicable) in sequence to maintain setpoint.

2. Separate space temperature setpoints shall be provided for occupied and unoccupied periods.

3. Normal control device state or position shall be as follows:

a. Coil valve shall be last position

B. Run Conditions

1. The unit shall run based upon an operator adjustable schedule in the following modes:

a. Occupied Mode: The unit shall maintain a 78°F cooling setpoint and a 68°F heating setpoint.
b. Unoccupied Mode (night setback): The unit shall maintain an 85°F cooling setpoint and a 55°F heating setpoint.

C. Occupied Mode:

1. When zone temperature is less than its heating setpoint, the controller shall enable heating to maintain the zone temperature heating setpoint.

D. Heating Coil and Perimeter Heating Valves

1. Occupied Mode:

a. The controller shall measure the zone temperature and modulate the heating coil valve in unison with the perimeter heating valves to maintain the zone temperature heating setpoint.
b. The controller shall limit reheat coil valve position to maintain a discharge air temperature less than 15°F above the zone temperature.

2. Unoccupied Mode:

a. The controller shall measure the zone temperature and modulate the perimeter heating valves to maintain the zone temperature unoccupied heating setpoint. Upon a drop of 2°F below the unoccupied heating setpoint, the associated air handling unit shall run and the reheat coil valve shall modulate in unison with the perimeter heating valves. Air handling unit shall continue to run until all zones are satisfied.
b. The controller shall limit reheat coil valve position to maintain a discharge air temperature less than 15°F above the zone temperature.

E. Alarms shall be provided as follows:

1. Low Space Temp: If the space temperature is lower than the heating setpoint by 5°F for more than 15 minutes.

F. BAS Points List

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AVI**	**AVO**	**BVI**	**BVO**	**Trend**	**Alarm**	**Show On Graphic**
Space Temperature	x								x	x	x
Space Setpoint Adjust	x										x

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AVI**	**AVO**	**BVI**	**BVO**	**Trend**	**Alarm**	**Show On Graphic**
Discharge Air Temp	**x**								**x**		**x**
Coil Valve Position		**x**									**x**
Override Switch			**x**						**x**		**x**
Perimeter Heating Valve Position				**x**					**x**		**x**

END OF SECTION

SECTION 26 14 00

WIRING DEVICES

(Electrical Trade Bid Required)

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Provide wall switches.

B. Provide receptacles.

C. Provide counter-top devices.

D. Provide cover plates.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.

B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph, or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contactor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.

C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.03 SUBMITTALS

A. Submit product data in accordance with Section 26 01 00.

1.04 REGULATORY REFERENCES

A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 26 01 00.

1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES

A. Subject to compliance with requirements, provide products by the following:

1. Wall switches:

   a. Bryant
   b. Hubbell
   c. Pass & Seymour
   d. Cooper Wiring Devices
   e. Leviton

2. Receptacles:

   a. Bryant
   b. Hubbell
   c. Pass & Seymour
   d. Cooper Wiring Devices
   e. Leviton

3. Counter-top devices:

   a. Mockett

4. Cover plates:

   a. Bryant
   b. Hubbell
   c. Pass & Seymour
   d. Cooper Wiring Devices
   e. Leviton

B. Substitutions: Items of equal quality, function, and performance may be proposed for substituting by following the procedures outlined in Section 26 01 00.

2.02 SWITCHES

A. 120-277 Volt Switches: Quiet type, toggle handle, with totally enclosed case, rated 20 ampere or as indicated on the Drawings with silver cadmium oxide contacts. Provide matching two-pole, 3-way, and 4-way switches as indicated. Switches shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

B. Switches shall be horsepower rated when used to control motor loads.

C. Color: To be selected by Architect from the manufacturer's full color range.

D. Handles shall be lighted if indicated.

2.03 INCANDESCENT DIMMING SWITCH

A. Provide general-duty flush, single-pole dimming switches, rated 600 watt minimum of as required with 120 volts slide type intensity control, separate on/off switch and pigtail lead terminals. Color

shall match standard switches. Switches shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

2.04 FLUORESCENT DIMMING SWITCH

A. Provide fluorescent dimming switches with configurations and ratings suitable for the intended use and compatible with provided ballast. Unit shall have slide type intensity control and an on/off switch. Color shall match standard switches. Switches shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

2.05 KEY SWITCHES

A. 120-277 Volt Switches: Key-operated, rated 20 ampere or as indicated on Drawings. Specification grade. Provide matching two-pole, three-way, and four-way switches as indicated. Switches shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

B. Color: To be selected by Architect from the manufacturer's full color range.

2.06 LOW VOLTAGE DIMMING SWITCH

A. Provide low voltage dimming switches with configurations and ratings suitable for the intended use and compatible with provided transformers.

B. 0-10 volt stand-alone dimming switches shall be large paddle type with captive linear dimmer slide. Switch shall be compatible with fluorescent ballasts and LED drivers that are compliant to IEC 60929 0-10V current sinking control. Provide with matching power pack for on/off control. Lutron DIVA DVTV-XX or equivalent.

C. Color: To be selected by Architect from the manufacturer's full color range.

D. Provide barrier (partition) in switch outlet boxes where low voltage dimmer switches are ganged with line voltage switches.

E. The Electrical Contractor, in cooperation with lighting control manufacturer and light fixture manufacturers, is responsible for ensuring compatibility between all LED drivers and the lighting control system components. All proposed LED fixtures shall be tested by the lighting control manufacturer at the factory to verify compatibility prior to installation in the field. If any LED fixture is determined to be not compatible with the proposed lighting control system, it is the Electrical Contractor's responsibility to work with the light fixture manufacturer to provide a driver that is compatible with the lighting control system. All 0-10 VDC LED dimming drivers shall meet the requirements of IEC 60929 for current sinking control and shall have an isolate 0-10 VDC control circuit.

2.07 OCCUPANCY SENSOR SWITCH

A. The passive infrared sensor shall be a completely self-contained control system that replaces a standard toggle switch. Switching mechanism shall be a latching air gap relay, compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices shall not be allowed. Sensor shall have ground wire and grounded strap for safety.

B. Sensor shall be capable of detecting presence in the control area by detecting changes in infrared energy. Small movements shall be detected, such as when a person is writing while seated at a desk.

C. Sensor shall utilize advanced control logic based on RISC (Reduced Instruction-Set Circuit) microcontroller.

D. Detection Signature Processing (DSP) shall be used to avoid false offs and false activations and to provide immunity to RFI and EMI.

E. Continuously adjusting Zero Cross relay control shall be used to guarantee reliable operation with non-linear loads (electronic, PL lamp ballasts) even with temperature changes and product aging.

F. Sensor shall utilize SmartSet™ technology to optimize the sensor behavior to fit occupant usage patterns and adjust sensitivity and time delay to changing conditions. The use of SmartSet shall be selectable by user with a DIP switch.

G. Sensor shall have a time delay that is adjusted automatically (with the SmartSet setting) or shall have a fixed time delay of 5, 10, 15, 20, or 30 minutes, walk-through mode, or test mode, set by DIP switch. In walk-through mode, lights shall turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

H. Sensor shall have the choice of light flash alert and/or audible alert of impending light shut off, selectable with DIP switch.

I. Sensor shall have sensitivity adjustment that is set to either automatic (SmartSet setting) or reduced sensitivity, and is set with DIP switch.

J. Sensor shall have a built-in light level feature selectable with DIP switch. During set up of light level control, sensor shall learn desired hold-off level, requiring only one step.

K. Sensor shall have automatic-ON or manual-ON operation adjustable with DIP switch.

L. Sensor shall operate at universal voltages of 100, 120, 230, or 277 V AC; 50/60 Hz.

M. Sensor shall have no minimum load requirement and shall be capable of switching 0 to 800 watts fluorescent/incandescent or 1/6 hp at 100/120V AC, 50/60 Hz; 0 to 1200 watts fluorescent or 1/6 hp at 230/277VAC, 50/60 Hz.

N. Sensor shall utilize a temperature compensated, dual element sensor, and a multi-element Fresnel lens.

O. For vandal resistance, Fresnel lens shall be made of hard, 1.0mm Poly IR 2 material that offers greater sensitivity to motion and superior detection performance. Lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

P. To assure detection at desktop level uniformly across the space, sensor shall have a two-level, 28-segment, multi-element Fresnel lens system.

Q. Sensor shall cover up to 300 sq ft for walking motion, with a field of view of 180 degrees.

R. Adjustments and mounting hardware shall be concealed under a removable, tamper resistant cover to prevent tampering of adjustments and hardware.

S. For safety, sensor shall have a 100% off switch with no leakage current to the load.

T. Sensor shall not protrude more than 3/8" from the wall and shall blend in aesthetically.

U. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

V. Sensor shall have standard 5-year warranty and shall be UL and CUL listed.

W. Wattstopper WA-200 or equivalent.

2.08 LOCAL DIGITAL TIMESWITCH

A. The digital time switch shall be programmable to turn lights off after a preset time.

B. Time switch shall be a completely self-contained control system that replaces the standard toggle switch. It shall have a ground wire and ground strap for safety. Switching mechanism shall be a latching air gap relay.

C. Zero Crossing Circuitry shall be used to increase the relay life, protect from the effects of inrush current, and increase the switch's longevity.

D. Time switch shall be compatible with all electronic ballasts, motor loads, compact fluorescent and inductive loads. Triac and other harmonic generating devices shall not be allowed.

E. Time switch shall operate at universal voltages of 100-300 VAC; 50/60 Hz.

F. Time switch shall have no minimum load requirement and shall be capable of controlling 0 to 800 watt incandescent, fluorescent @ 100/120 VAC, 50/60 Hz; 0 to 1200 watts fluorescent @ 230/277 VAC, 50/60 Hz; 1/6 hp @ 125 VAC.

G. Time scroll feature shall allow manual overriding of the preset time-out period. Selecting time scroll UP shall allow time-out period to scroll up throughout the timer possibilities to the maximum. Time scroll DN (down) shall allow time-out period to scroll down to minimum.

H. Time switch shall have a one second light flash warning at five minutes before the timer runs out and twice when the countdown reaches one minute (when used to control lighting loads).

I. Time switch shall have a beep warning that shall sound every five seconds once the time switch countdown reaches one minute.

J. Time switch shall have manual feature for timer reset where pressing the ON/OFF switch for more than 2 seconds resets the timer to the programmed time-out period.

K. Time switch shall have an electroluminescent backlit Liquid Crystal Display that shows the timer's countdown.

L. Time switch shall fit behind a decorator style faceplate. The calibration switch for setting time-out, time scroll, one second light flash, and beep warning shall be concealed to prevent tampering of adjustments and hardware.

M. Time-out period shall be adjustable in increments of 5 minutes from 5 minutes to 1 hour, and in increments of 15 minutes from 1 hour to 12 hours.

N. Time switch shall be capable of operating as an ON/OFF switch.

O. For ease of installation and cleaner wiring, the switch shall utilize terminal style wiring.

P. The time switch shall not protrude more than 1/8" from the wall and should blend in aesthetically.

Q. For safety, the time switch shall have a 100% OFF override switch with no leakage current to the load.

R. For safety, in the event there is an open circuit in the AC line such as a ballast or lamp failure, the time switch shall automatically switch to OFF mode.

S. To ensure quality and reliability, time switch shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

T. Time switch shall have 5-year warranty and shall be UL and CUL listed

U. Wattstopper TS-400 or equivalent.

2.09 RECEPTACLES

A. Standard Duplex Receptacles: Full gang size, polarized, duplex, side and back wired, parallel blade, U grounding slot, specification grade, rated at 20 amperes or as indicated on the Drawings, 125 volts, designed for split feed service, NEMA Type 5 20R. Receptacles shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity. Receptacles intended for use in wet locations shall be weather-resistant, Type WR.

B. Color: To be selected by Architect from the manufacturer's full color range.

C. Ground fault interrupter receptacles shall be rated 20 amperes with built in test and reset buttons, and shall comply with NEMA WD 1, NEMA WD 6, UL 498, Federal Specification W-C-596, and UL943, Class A. Feed through feature will protect standard receptacles located downstream. Include indicator light that is lighted when device is tripped. Must have Self-test feature (conducts an automatic test every three seconds, ensuring ground fault protection. If ground fault protection is compromised, power to the receptacle must be discontinued.

D. Special Receptacles: Provide special receptacles of type and located as indicated on the Drawings. Type shall be suitable for intended equipment. Receptacles shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

E. Isolated Ground Receptacles: Provide isolated ground receptacle where indicated. Receptacle shall be orange. Receptacles shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

F. Corrosion-Resistant Receptacles: Polarized, side and back wired, duplex, screw-type terminals, parallel blade, U-grounding slot, specification grade - rated at 20 amperes, 125 volt. Receptacle shall be constructed of grey urea. All metal parts shall be either stainless steel or nickel plated brass, NEMA Type 5-20R. Receptacles shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

G. Clock hanger outlets shall be provided where indicated on the Drawings and be rated 20 amp, 125 volt, three-wire grounding type receptacle recessed in the outlet body, provided with a hook hanger. Receptacles shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.

H. TVSS receptacles shall be rated for 20 amperes providing surge protection for hot-to-neutral, hot-to-ground, and neutral-to-ground. Provide 8-hole back and side wired receptacles. Include built-in LED indicators to verify surge protection and ground. Receptacles shall comply with UL 1449 and UL 498 requirements.

I. USB charging duplex receptacles shall be rated for 15 amperes with dual USB charging ports and a minimum charging capacity of 2.1A at 5 VDC.

J. Schedule of Use:

1. Corrosion-resistant receptacles shall be used in areas of high moisture and in all process areas.
2. Standard receptacles shall be used in interior dry locations including electrical room.
3. Isolated ground receptacles shall be used where indicated on the Drawings for power to computers and control terminals.
4. Ground fault interrupter receptacles shall be used where required by NEC and where indicated on the Drawings.

2.10 COUNTER-TOP DEVICES

A. The recessed counter-top grommet shall have a flip-up cover plate, and consist of four (4) single receptacles and four (4) data jacks. The receptacles will be connected and prewired to a 6-foot cord with plug. The data jacks will be wired by the Contractor. A mounting bracket shall be provided to securely fasten the grommet to the underside of the counter-top. The receptacle devices shall be plugged into a receptacle mounted in the lower cavity of the desk, fed from underslab or underfloor conduit(s). The data jacks shall be connected by cabling entering into the desk in underslab or underfloor conduit(s). Mockett, #PCS17, or equivalent.

2.11 DROP CORD RECEPTACLE

A. The drop cord receptacle shall be provided using a retractable polymer extension cord unit. The extension cord shall be industrial-duty of heavy-gauge steel with lifetime lubrication, heavy-duty main spring, steel mounting flange, disengagable ratchet lock, 40-foot, three conductor #12 AWG SJTW cord and 4-way tap containing 20A, 125V separately grounded receptacles (and LED status light to indicate power). Mounting brackets shall accommodate either ceiling or wall mounting. Bayco #SL-8904-40, or equivalent.

2.12 COVER PLATES

A. Materials:

1. Stainless Steel: 0.040 inch thick minimum, accurately die cut, protected with release paper.
2. Cast Metal: Die cast profile, ribbed for strength, flash removed, primed with grey enamel, furnished complete with four mounting screws and sealing gaskets.
3. Gaskets: Resilient rubber or closed cell foam urethane.
4. Galvanized Steel: Hot dipped galvanized, heavy-duty stamped steel.
5. Flush-Mount Weatherproof While-in-Use Covers: Polycarbonate self-closing receptacle cover rated NEMA 3R. Weatherproof when attachment plug cap is inserted. Two (2) exit ports for 12/3 cord. Complies with NEC 406-8(b) and UL 514D. Typical to Pass & Seymour WIUFC10. The cover shall be identified as "extra duty."

B. Schedule of Use:

1. Stainless Steel: To be used in all interior dry locations including lab and public area subject to high abuse.
2. Cast Metal: To be used in exterior locations, areas of high moisture or where a weatherproof type device is indicated. All cast type boxes shall have a cast gasketed cover.
3. Galvanized steel to be used in interior dry utility areas including electrical and mechanical areas.

4. Weatherproof while in use: To be used for all exterior receptacles or areas of high moisture, and with devices labeled “WP”.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Switches:

1. Mount switches 44 inches above floor to center of device unless otherwise indicated.
2. Switches shall be located to agree with architectural features and shall not interfere with work by other Trades.
3. The location of all devices shall be subject to the approval of the Engineer. The Drawings show approximate locations only.
4. Where groups of switches are shown, they shall be installed in approved gangable boxes with one piece faceplates that completely cover opening in wall.
5. Low voltage dimmer shall be connected electrically before transformers or as otherwise required by manufacturer.

B. Receptacles:

1. Mount receptacles 18" above finished floor or grade to center of device, unless otherwise noted on the Drawings, with grounding pole at bottom.
2. Outlets shall be located to agree with architectural features and shall not interfere with work by other trades.
3. Do not megger test any circuits when TVSS is connected.

C. Cover plates:

1. Install cover plates on all wiring devices.
2. Metal faceplates shall be grounded.
3. Provide red colored faceplates for all devices wired to emergency or standby power. Provide label indicating the panelboard and circuit # the device is powered from.

D. Identification:

1. Identify each receptacle with panelboard identification and circuit number with durable wire markers or tags inside outlet boxes.

END OF SECTION

SPECIAL PROVISION
SECTION 403
HOT MIX ASPHALT

Desc. Of Course	Grad Design.	Item Number	Total Thick	No. Of Layers	Comp. Notes
1 ½" HMA Overlay Areas with Shim Mainline Travelway & Shoulders					
Wearing	12.5 mm	403.208	1 ½"	1	1,5,10,17
Shim	9.5 mm	403.211	variable	1/more	1,2,4,10,11,14
5" HMA Overlay Areas Shoulder Widening Areas					
Wearing	12.5 mm	403.208	1 ½"	1	1,5,10,17
Intermediate	12.5 mm	403.213	1 ½"	1	1,4,10,17
Base	12.5 mm	403.213	2"	1	1,4,10,17

COMPLEMENTARY NOTES

1. The required PGAB for this mixture will meet a **PG 64-28** grading.
2. The incentive/disincentive provisions for density shall not apply. Rollers shall meet the requirements of this special provision.
4. The design traffic level for mix placed shall be 0.3 to <3 million ESALS. The design, verification, Quality Control, and Acceptance tests for this mix will be performed at **50 gyrations**.
5. The aggregate qualities shall meet the design traffic level of 3 to <10 million ESALS for mix placed under this contract. The design, verification, Quality Control, and Acceptance tests for this mix will be performed at **75 gyrations**.
10. Section 106.6 Acceptance, (2) Method D. One sample will be taken from the paver hopper or the truck body per **500 ton**, per pay item. The mix will be tested for gradation and PGAB content. Disputes will not be allowed. If the mix is within the tolerances listed in Table 8 below, the Department will pay the contract unit price.

TABLE 8

Property	USL and LSL
Percent Passing 4.75 mm and larger sieves	Target +/-7
Percent Passing 2.36 mm to 1.18 mm sieves	Target +/-5
Percent Passing 0.60 mm	Target +/-4
Percent Passing 0.30 mm to 0.075 mm sieve	Target +/-3
PGAB Content	Target +/-0.5
% TMD (In-place Density)	95.0% +/- 2.5%

If the test results for each **500 ton** increment are outside these limits the following deductions (Table 8B) shall apply to the HMA quantity represented by the test. A second consecutive failing test shall result in cessation of production.

TABLE 8B

PGAB Content	-5%
2.36 mm sieve	-2%
0.30 mm sieve	-1%
0.075 mm sieve	-2%
In-Place Density	- 5%

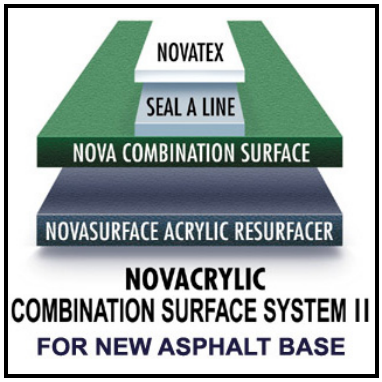
11. The combined aggregate gradation required for this item shall be classified as a 9.5mm "**fine graded "** mixture, (using the Primary Control Sieve control point) as defined in 703.09.
14. The combined aggregate gradation required for this item shall be classified as a 9.5mm Thin Lift Mixture (TLM) mixture, using the Aggregate Gradation Control Points as defined in 703.09.
17. The Contractor shall cut two 6 inch cores per **250 ton** per pay item, which shall be tested for percent TMD per AASHTO T-269. If the average of the two tests per **250 ton** result is below 92.5%, the disincentive from Table 8B shall apply.

Tack Coat

A tack coat of emulsified asphalt, RS-1 or RS-1h, Item 409.15 shall be applied to any existing pavement at a rate of approximately 0.030 gal/yd², and on milled pavement approximately 0.05 gal/yd² prior to placing a new course. A fog coat of emulsified asphalt shall be applied between shim /base courses and surface course as well as to any bridge membrane prior to the placement of HMA layers at a rate not to exceed 0.030 gal/yd². Cleaning objectionable material from the pavement and furnishing and applying Item 409.15 bituminous materials to joints and contact surfaces is incidental to the contract paving items.

GUIDE SPECIFICATION

COMBINATION SURFACE SYSTEM
• FOR NEW HOT MIX ASPHALT TENNIS COURTS



I. PART 1 - GENERAL

1.1 SUMMARY

A. This section is a part of the entire set of Contract Documents and shall be coordinated with the applicable provisions of the other parts.

B. Related Sections:

1. STANDARDS

All work shall be done in accordance with American Sports Builders Association (A.S.B.A.) guide specifications.

2. SITE INVESTIGATION

Refer A.S.B.A. guide specification 1.B.

3. VEGETATION CONTROL

Refer to A.S.B.A. guide specification 1.D.

4. SITE PREPARATION, EARTHWORK, DRAINAGE AND SUBBASE CONSTRUCTION

Refer to A.S.B.A. guide specification 1.C.

5. COURT CONSTRUCTION

Follow A.S.B.A. guide specification II. I: Hot Mix Asphalt Tennis Courts. The following are covered in these documents: Slope Requirement, Perimeter Edging, Base Construction, Compaction, Base Tolerance, Leveling Course, Asphalt Surface Course, and Asphalt Mix Design.

1.2 SCOPE OF WORK

A. This specification covers the construction and installation for: *(#)* Tennis courts at *(project name & location)*.

B. Tennis courts shall be cleaned using a stiff bristle broom and gas powered blower or water based pressure spray unit capable of generating 2500 psi at the nozzle tip, to remove all dirt and debris.

C. The work to be performed under this specification includes all labor, equipment, materials and supplies necessary for the installation of the tennis courts included in this contract.

II. PART 2 - PRODUCTS

2.1 TENNIS COURT SURFACE MATERIAL

A. Tennis Court Surfacing Materials shall be:

1. Novacrylic, as manufactured by Nova Sports U.S.A., 6 Industrial Rd., Bldg. #2., Milford, MA 01757. 800-USA-NOVA

2. Approved equal

B. All coatings shall be pure acrylic, containing no asphaltic or tar emulsions, nor any vinyl, alkyd or non-acrylic resins. The color system shall be factory-mixed compounds requiring only the addition of water at the jobsite except for the addition of sand to Novasurface. All materials shall be delivered to the jobsite in sealed containers with the manufacturer's label affixed.

C. Substitution: If other than the product specified, the contractor shall submit at least 7 days prior to the bid date a complete type written list of proposed substitutions with sufficient data, drawings, samples and literature to demonstrate to the owners satisfaction that the proposed substitution is of equal quality and utility to that originally specified. Information must include a QUV test of at least 2000 hours illustrating the UV stability of the system. The color system shall have an ITF pace rating in Category 4. Under no circumstances will systems from multiple manufacturers be considered.

III. PART 3 - EXECUTION

3.1 APPLICATION

A. New asphalt pavement shall cure for 14 days prior to application of any surfacing materials.

B. Contractors must notify the Landscape Architect of all applications, 48 hours prior to installation.

C. The surface to be coated shall be inspected and made sure to be free of grease, oil, dust, dirt and other foreign matter before starting work.

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D. The surface shall be flooded. Any ponding water remaining that is deep enough to cover the thickness of a five-cent piece shall be corrected using a patch mix consisting of Novabond, 50-mesh sand and Portland cement, as per manufacturers directions. Depressions must be primed with a 50% dilution of Novabond and water prior to patching.

E. Application shall proceed only if the surface is dry and clean and the temperature is at least fifty degrees (50°F) and rising, and the surface temperature is not in excess of one hundred forty degrees (140°F). Do not apply coatings when rain is imminent.

F. Each coat in this system must dry completely before next application. Between each coat, inspect entire surface. Any defects should be repaired. Scrape surface to remove any lumps, and broom or blow off all loose matter.

G. Using a neoprene rubber squeegee, apply one (1) coat of Novasurface acrylic resurfacer, diluted with one (1) part clean water to two (2) parts Novasurface. Clean, bagged sand shall be incorporated into the diluted Novasurface at the rate of ten (10) to fifteen (15) Lbs. per gallon. Sand gradation shall be 50 to 60-mesh. Allow application to dry thoroughly.

H. Using a neoprene rubber squeegee, apply two (2) coats of Novacrylic Combination Surface, diluted two (2) parts concentrated material to one (1) part clean water (colors to be designated by owner). Allow each application to dry thoroughly. The quantity of water used in diluting these coatings may exceed the quantity specified by only a small amount and only if coatings are drying too rapidly. Permission of the owner shall be obtained before adding additional water.

3.2 LINE MARKINGS

A. Upon completion and acceptance of the tennis surface, this Contractor shall prepare and paint lines for tennis.

B. All lines are to be applied by painting between masking tape with a paintbrush or roller, according to U.S.T.A specifications.

C. Prime masked lines with Seal-A-Line. Allow application to dry.

D. Paint lines with Novatex textured line paint. Allow application to dry.

E. Remove masking tape immediately after lines are dry.

F. Protect adjacent areas and structures (fences, posts, sidewalks, buildings, etc.), which are not to be coated. In the event that coatings are applied to above, remove immediately before drying is complete.

3.3 COMPLETION

A. Upon completion, the contractor shall insure proper removal of all construction debris, surplus materials, empty containers and wash water, and shall leave the site in a condition acceptable to the owner. The court is to be left secure so as to prevent vandalism.

3.4 LIMITATIONS

A. Apply coatings only when ambient temperature is 50 degrees F. and rising, and the surface temperature is not in excess of one hundred forty (140) degrees F.

B. All NOVACRYLIC coatings are waterborne and cannot cure in cold temperatures or when subject to moisture. Care should be taken not to apply coatings when rain is forecast or sudden drop of temperature is expected. Climatic conditions such as very cool evenings and high dew points dictate that work should be completed early in the day so the coatings can be exposed to enough warm sunlight to form a film before sunset. The opposite applies during times of high heat, low humidity and drying breezes: under these conditions, work very early in the morning or very late in the day. If the product seems to be drying too fast in hot weather, mist the pavement with water to make the application easier. Care must be taken to allow each application to dry thoroughly prior to recoating.

END OF SECTION

IMPORTANT:

THIS SPECIFICATION IS INTENDED ONLY AS A GUIDE, CONSULT WITH A PROFESSIONAL ENGINEER OR ARCHITECT PRIOR TO USING AS A FORMAL SPECIFICATION.

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PLEXITRAC LIGHTNING

POLYRESIN TRACK SYSTEM

APPLICATION FOR ASPHALT SURFACES

1.0 DESCRIPTION

This specification covers the installation of a new, high performance resilient track surfacing system for new asphalt surfaces. This track system utilizes specially compounded, pigmented, water-based binders and select rubber granules to provide strength, flexibility and to prevent ultra violet degradation. Also a topcoat is applied to further protect against harmful UV rays and to reduce wear. The system provides a durable, resilient, spike resistant surface for recreational and competitive use.

NOTE: The success of the running track surface is dependent on a sound base (with good drainage) and the asphalt concrete meeting the requirements of The National Asphalt Paving Association and the U.S. Tennis Court and Track Builders Association. Variations of the existing subsurface should not exceed 1/8" in 10' when measured in any direction with a straightedge.

2.0 MATERIALS – All liquid products shall be supplied by one manufacturer.

2.1 **Court Patch Binder** – shall comply with Specification 10.14 of California Products Corporation.

2.2 **CP-4125** – Latex emulsion tack coat.

2.3 **Plexitrac Binder** – shall comply with Specification 10.73 of California Products Corporation **(Black)**.

2.4 **Rubber Granules** – select granules for job mixing with Plexitrac Binder.

2.5 **Plexitrac Coating** – shall comply with Specification 10.70 of California Products Corporation **(Black)**.

2.6 **Plexicolor Line Paint** – shall comply with Specification 10.4 of California Products Corporation.

2.7 **Plexicolor Pigment** – Water-borne pigment for enhanced color depth **(Black).**

2.8 **Water** – The water used in all mixtures shall be fresh and potable.

3.0 SURFACE PREPARATION

3.1 Prior to the application of surfacing materials, the entire surface should be flooded and checked for minor depressions or irregularities. Any puddled area covering a nickel shall be marked and repaired with Court Patch Binder according to CPC Specification 10.14. After patching, the asphalt surface shall not vary more than 1/8" in 10' measured in any direction.

4.0 CONSTRUCTION

Allow all patchwork to dry thoroughly. The surface to be coated must be sound, smooth and free from dust, dirt, or oily materials.

4.1 **Primer Coat** – A tack coat of CP-4125 must be applied over the entire surface at a rate of .04 gal./s.y. Allow to dry thoroughly.

4.2 **Track Surface** – Materials shall be applied to achieve a dense uniform surface of not less than the specified thickness in not less than three layers. The Plexitrac Binder must be evenly distributed amongst the rubber granules upon the application of materials. Coverage rates (measured in accordance with I.A.A.F. standards):

Color:	**Thickness:**	**Rubber Granules:**	**Plexitrac Binder (Black):**
Black	3/8" (9.5MM)	10.5 lbs./s.y.	.60 gal./s.y.
Black	½" (12.5MM)	14.0 lbs./s.y.	.78 gal./s.y.

Coverage rate based on undiluted product. Binder to rubber ratio shall be 1 gallon Plexitrac Binder per 18 lbs. of Black S.B.R. Rubber.

To further enhance color depth, it is recommended to add 5 gallons of Plexicolor Pigment to each 55-gallon drum of Plexitrac Binder on the final spray coat. Plexicolor Pigment is a water-borne colorant available from California Products.

The coverage rate for rubber granules is dependent on the specific gravity (density) of the rubber and the installation method of the surfacing system. Different densities will affect the dry bulking value of the rubber, which determines the weight per square yard for a specified thickness. The specific gravity for rubber particles can vary between colors, size, and manufacturers. It is recommended to consult the manufacturer for more information. Also, different application methods can affect the overall system density requiring lower or higher volumes of product. System weights and volumes shall be verified by on site sample methods.

4.3 **Top Coat** – Plexitrac Coating shall be applied by approved spray equipment at a rate of not less than .10 gallons per square yard. If a smoother finish is desired, you may substitute Plexitrac Surfacer at not less than .30 gal./s.y.

4.4 **Line striping** – Plexicolor line paint shall be applied to meet all rules and regulations of the local track federation.

5.0 LIMITATIONS

- No part of the construction shall be conducted during rainfall or when rain is imminent.
- Allow 4-5 hours to cure at least 70F. Lower temperature and higher temperature will increase the drying time.
- Do not apply when surface temperature is above 130F.
- Apply only when ambient temperature is 50F and rising.
- Keep from freezing. Do not store in the hot sun.
- The Polyresin Track System will not prevent pavement cracks from occurring.
- Allow applications to thoroughly cure prior to subsequent applications.
- Use caution when applying materials near adjacent areas. Mask when necessary to prevent over spray.
- Allow new asphalt to cure for a minimum of 14 days.

6.0 PHYSICAL PROPERTIES

6.1 **Plexitrac Binder** is a high solids pigmented binder containing special fibers to promote strength. The Plexitrac Binder is capable of drying/curing to a depth of 10mm in a single lift when mixed at the specified levels of 1-3mm rubber granules:

Viscosity > 90 ku or >1200 cps Pigment and Filler > 6% total formula

6.2 **Plexitrac Coating** is a fully pigmented acrylic topcoat system designed to have a high resistance to ultraviolet light. It is made from acrylic resins specifically designed for track surfaces to provide a tough, long lasting surface that can withstand the elements. It should be applied in 2 coats at a coverage rate of .05 gal./s.y. per coat.

6.3 **Rubber Properties**: 1-3mm Sieve Analysis – other sieve sizes may be used to achieve a different surface texture at the discretion of the owner. Rubber supply can vary. Check compatibility with California Products Corporation.

Mesh	M.M.	% Retained	Specific Gravity: Hardness: Shore A, 55-75 durometer
6	3.36	0-15%	Black Rubber Granules: 1.15-1.40
10	2.00	60-85%	Color EPDM Rubber Granules: 1.40-1.60
18	1.00	10-30%	
PAN 1.00	0-5%		

7.0 **DISCLAIMER:** Suggestions for use of our product or inclusion of descriptive material from patents should not be understood as recommending the use of our product in violation of any patents.

8.0 GENERAL:

Materials must be specifically designed for the construction of running track surfaces. Materials specified shall be delivered to the site in sealed, properly labeled drums with

California Products labels that are stenciled with the proper patch numbers. Products packaged or labeled in any other manner will not be accepted. Minimal addition of clear, fresh water at the job site is dependent on temperature and material flow. Coverage rates are based upon material prior to mixing with water. Dispose of empty containers in accordance with local, state and federal regulations.