
Newport Harbor High School Narrative Changes – Mechanical Addendum 1

January 26th, 2021

Attention: Mr. Lance Bidnick
Project: Newport Harbor High School
Newport Beach, California 92663
Subject: Narrative Changes – Mechanical Addendum 1

The following changes, omissions, and/or additions are issued to supplement or revise the Contract Documents and shall apply to proposals made and to the execution of the various parts of the work affected thereby, all other conditions shall remain the same.

Careful note of the Addendum#1 shall be taken by all parties of interest so that the proper allowances may be made in strict accordance with the Addendum, and that all trades shall be fully advised in the performance of the work which will be required of them.

Bidder shall acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification. Unless specifically changed by this addendum, the remainder of the drawings, documents and specifications shall remain in effect as originally issued

MECHANICAL PLANS

Sheet T-1

1. Revised sheet index to include added M-2.3 and M-2.4 Detail sheets.

Sheet M-0.1

1. Revised sheet index to include added M-2.3 and M-2.4 Detail sheets.

Sheet M-0.2

1. Revised characteristics of AC units 1-4. See delta 1 cloud.

Sheet MD-1.1

1. Revised demo keynotes #3 & #4 specifying duct supports (return and supply) & platform to be replaced new. See delta 1 cloud.
2. Added electrical boxes and demo keynote #10 specifying enclosure for electrical pipes thru roof to be replaced new. See delta 1 cloud.
3. Added keynote #11 specifying existing platform for duct drops and supports to remain. See delta 1 cloud.
4. Added platform for duct supports on drawings. See delta 1 cloud.

Sheet M-1.1

1. Revised construction keynote #1. Duct supports are specified as new instead of existing as it was shown previously. See delta 1 cloud.
2. Added One (1.no) fall protection device to center of roof. See delta 1 cloud
3. Added electrical boxes and construction keynote #15 specifying new enclosures for electrical thru roof penetrations to be provided. See delta 1 cloud.

4. Revised construction keynote #14 specifying TRM1200S as an alternative for fall protection.
5. Added construction keynote #16 to repair and finish platform for duct supports and drops see detail #4/M-2.3 provided.

Sheet M-1.2

1. Revised thermostat quantities and locations. See delta 1 cloud

Sheet M-1.3

1. Revised thermostat quantities and locations. See delta 1 cloud

Sheet M-2.1

Detail B

1. Revised detail to display existing platform for duct drops and supports. Revised label to indicate curb is existing and not new as it was shown previously. See delta 1 cloud.
2. Revised detail to include reference to detail F duct thru roof.

Detail C

3. Added note referencing detail for alternate installation with higher, pre fab curb to details. See revised sheet

Detail D

4. Added note referencing detail for alternate installation with higher, pre fab curb to details. See revised sheet

Detail E

5. Revised detail to identify duct supports as new (previously shown as existing). See delta 1 cloud
6. Revised duct supports to round base and flashing. See delta 1 cloud.
7. Revised detail including enlarged views to reflect new assembly with round base.
8. Added enlarged isometric view for flashing pipe/boot in detail E.

Detail F

9. Revised detail F to show existing roof platform and fastening to new curb and deck. Duct drops identified as existing added/included isometric view for flashing See delta 1 cloud

Sheet M-2.2

1. Revised detail 2 to identify duct supports as new (previously shown as existing). See delta 1 cloud
2. Revised detail 2 duct supports to round base and flashing. See delta 1 cloud.
3. Revised detail 2's enlarged views to reflect new assembly with round base.
4. Added enlarged isometric view for flashing pipe/boot in detail 2.
5. Revised detail 3 specifying Tractel TRM1200S for fall protection in place of Guardian CB-1. See revised sheet for changes.
6. Revised top view of fall protection detail #3. Size of base plate, and minimum edge distances to fit TRM1200S.
7. Added enlarged flashing detail for fall protection detail #3.

Sheet M-2.3

1. Added sheet with details; #1 for piping through roof leading from electrical/conduit boxes to be re-used

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2. #2 and #3 detailing alternative installation with 14" pre-fab curb.
 3. #4 for edge flashing of existing duct platforms. See delta 1 cloud

Sheet M-2.4

1. Added sheet presenting calculations for pre-fabricated curb.

Sheet M-3.1

1. Revised communication riser diagram for units wiring directly from zone dampers to thermostats, number of zones for each unit corrected and instructions for powering controllers added to notes.
2. Revised Multizone and AC unit zone control diagram. Building static pressure sensor and return air damper actuator now incorporated.

MECHANICAL SPECS

Section 075216.13 SBS MODIFIED BITUMINOUS MEMBRANE ROOFING, COLD-APPLIED

1. Replaced section 07 01 50 roof maintenance with section 07 52 16.13 SBS MODIFIED BITUMINOUS MEMBRANE ROOFING, COLD-APPLIED

Section 23 09 00

1. Added section to mechanical specs.

If you have any questions concerning this please feel free call me.
Very truly yours,

Optimum Energy Design

Abby Banerjee
Principal

SECTION 075216.13 - SBS MODIFIED BITUMINOUS MEMBRANE ROOFING, COLD-APPLIED

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. New flashings and repairs associated with HVAC upgrades:
 - a. Roof membrane and membrane base flashings.

1.2 DEFINITIONS

- ##### A. Roofing Terminology:
- Refer to ASTM D 1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site

1. Meet with Owner, project manager, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review drawings and specifications.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review temporary protection requirements for roofing system during and after installation.

1.4 ACTION SUBMITTALS

- ##### A. Product Data:
- For each type of product indicated.
- ##### B. Samples for Verification:
- For the following products:
1. Sheet roofing materials.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Product Certificate: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers names, with statement indicating that products to be provided meet the requirements of the Contract Documents.
- B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.
 - 1. Include letter from Manufacturer written for this Project indicating approval of Installer.
- C. Field Quality Control Reports: Reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions required and carried out.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
- B. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:
 - 1. An authorized full-time technical employee of the manufacturer.
 - 2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute, retained by the Contractor or the Manufacturer and approved by the Manufacturer.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT / FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove temporary plugs from roof drains at end of each day.
 - 4. Remove and discard temporary seals before beginning work on adjoining roofing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Flashings and Fastening: Provide base flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:
 - 1. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.
 - 2. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.

2.2 MATERIALS, GENERAL

- A. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

2.3 ROOFING MEMBRANE MATERIALS

- A. Base-Ply Sheet:
 - 1. SBS/RET/Urethane-modified asphalt coated composite fiberglass mat and fiberglass scrim reinforced high strength sheet, smooth surfaced, ASTM D6163 Type III Grade S.

- a. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 190 lbf/in (33 kN/m); cross machine direction 190 lbf/in (33 kN/m).
- b. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 320 lbf (1423 N); cross machine direction 320 lbf (1423 N).
- c. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 7 percent; cross machine direction, 4 percent.
- d. Low Temperature Flex, maximum, ASTM D5147: -35 deg. F (-37 deg. C).
- e. Thickness, minimum, ASTM D5147: 0.090 inch (2.3 mm).

B. SBS Modified Bituminous Membrane Granular-Surfaced Cap Sheet:

1. SBS-modified asphalt-coated glass-fiber-reinforced sheet, granular surfaced, ASTM D6163 Type I Grade G.
 - a. Exterior Fire-Test Exposure, ASTM E108: Class A.
 - b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 80 lbf/in (14 kN/m); Cross machine direction 75 lbf/in (13 kN/m).
 - c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 100 lbf (460 N); Cross machine direction 108 lbf (480 N).
 - d. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 7 percent; Cross machine direction 8 percent.
 - e. Low Temperature Flex, maximum, ASTM D5147: -15 deg. F (-26 deg. C).
 - f. Thickness, minimum, ASTM D5147: 0.120 inch (3.0 mm).

C. Flashing Sheets:

1. SBS-modified asphalt-coated glass-fiber-reinforced sheet, granular surfaced, ASTM D6163 Type I Grade G.
 - a. Exterior Fire-Test Exposure, ASTM E108: Class A.
 - b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 80 lbf/in (14 kN/m); Cross machine direction 75 lbf/in (13 kN/m).
 - c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 100 lbf (460 N); Cross machine direction 108 lbf (480 N).
 - d. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction 7 percent; Cross machine direction 8 percent.
 - e. Low Temperature Flex, maximum, ASTM D5147: -15 deg. F (-26 deg. C).
 - f. Thickness, minimum, ASTM D5147: 0.120 inch (3.0 mm).
2. Thermoplastic PVC flashing sheet, ASTM D 4434 Type IV internally fabric reinforced, Energy Star qualified, CRRC listed, and California Title 24 Energy Code compliant.
 - a. Tensile Strength at 0 deg. F (-18 deg. C), minimum, ASTM D 751: 300 lbf/in (52 kN/m).

- b. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D 751: 100 lbf (440 N).
- c. Elongation at 0 deg. F (-18 deg. C), minimum at fabric break, ASTM D 751: 25 percent.
- d. Minimum Thickness, nominal, ASTM D 751: 45 mils (1.1 mm).
- e. Exposed Face Color: White.
- f. Reflectance, ASTM C 1549: 86 percent.
- g. Thermal Emittance, ASTM C 1371: 0.86.
- h. Solar Reflectance Index (SRI), ASTM E 1980: 108.
- i. Recycled Content, minimum: 25 percent preconsumer.

D. Fluid-Applied Flashing Material:

- 1. Polyurethane roof coating system base coat, bio-based, low-odor low-VOC two-part, for use with a compatible top coat.
- 2. Polyurethane roof coating system top coat, bio-based low-odor low-VOC two-part, for application over compatible base coat.
- 3. Polyester Reinforcing and Protection Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings.
 - a. Tensile Strength, Minimum, ASTM D1682: 50 lbf (23 kg) avg..
 - b. Elongation, Minimum, ASTM D1682: 60 percent.
 - c. Tear Strength, Minimum, ASTM D1117: 16 lbf (7.3 kg) avg..
 - d. Weight: 3 oz./sq. yd (102 g/sq. m).

E. Detail Fabric:

- 1. Woven Glass Fiber Mesh, Vinyl-Coated: Non-shrinking, non-rotting, vinyl-coated woven glass mesh for reinforcing flashing seams, membrane laps, and other roof system detailing.
 - a. Tensile strength, 70 deg. F, min ASTM D146: Warp, 65 lbf/in (289 N); fill, 75 lbf/in (311 N).

2.4 COLD-APPLIED ADHESIVE MATERIALS

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Modified Bituminous Base-Ply and Cap Sheet Adhesive:
 - 1. Cold-applied bio-based low odor urethane roofing adhesive, two-part, USDA Bio Preferred, formulated for compatibility and use with specified roofing membranes and flashings.
 - a. Volatile Organic Compounds (VOC), maximum, ASTM D3690: 0 g/L.

- b. Low Temperature Flexibility, ASTM D2240: Pass at -30 deg F (-34 deg C).
- c. Solids, by Volume, ASTM D2697: 100 percent.
- d. Biobase Content, Minimum, ASTM D6866: 70 percent.

C. Flashing Sheet Adhesives:

- 1. Modified Bitumen Flashing Sheet: Cold-applied bio-based low odor urethane roofing adhesive, two-part, USDA Bio Preferred, formulated for compatibility and use with specified roofing membranes and flashings.
 - a. Volatile Organic Compounds (VOC), maximum, ASTM D3690: 0 g/L.
 - b. Low Temperature Flexibility, ASTM D2240: Pass at -30 deg F (-34 deg C).
 - c. Solids, by Volume, ASTM D2697: 100 percent.
 - d. Bio base Content, Minimum, ASTM D6866: 70 percent.
- 2. PVC Flashing Sheet over Equipment Platforms: Bonding adhesive, contact-type solvent-based low VOC, for bonding PVC non-fleece-backed single ply membranes and flashings to substrates.
 - a. VOC, maximum, ASTM D3960: 200 g/L.

- D. Seam Sealer and Patching Sealer: Acrylic elastomeric sealer, single-component, high solids, low-VOC, formulated for compatibility and use with specified roofing and wall substrates.
 - a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 50 g/L.
 - b. Tensile Strength, minimum, ASTM D412: 450 psi (3100 kPa).
 - c. Hardness, Shore A: 45.
 - d. Elongation, minimum, ASTM D412: 300 percent.
 - e. Impact Resistance, minimum: 160 in/lb (18 kN/m).

2.5 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
- B. Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.
 - 1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.
- C. Fasteners: Factory-coated steel fasteners meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 mm by 3 mm) thick; with anchors.

- E. Membrane Flashing: Manufacturer's standard, smooth-backed, sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
- F. Miscellaneous Accessories: Provide pourable sealers, preformed inside and outside corner sheet flashings, T-joint covers, clad metal, and other accessories.

2.6 ROOF SUBSTRATE BOARD AND ACCESSORIES

- A. Substrate Board:
 - 1. Cellulosic-fiber Insulation Board ASTM C208, Type II, Grades 1 and 2, with water-resistant binders, non-asphaltic primer coated on four sides and chemically treated for deterioration.
 - 2. Gypsum panel, glass-mat-faced, ASTM C1177/C1177M.
- B. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- C. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- D. Roof Insulation Adhesive:
 - 1. Urethane adhesive, bead-applied, low-rise two-component solvent-free low odor, formulated to adhere roof insulation to substrate.
 - a. Flame Spread Index, ASTM E84: 10.
 - b. Smoke Developed Index, ASTM E84: 30.
 - c. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.
 - d. Tensile Strength, minimum, ASTM D412: 250 psi (1720 kPa).
 - e. Peel Adhesion, minimum, ASTM D903: 17 lbf/in (2.50 kN/m).
 - f. Flexibility, 70 deg. F (39 deg. C), ASTM D816: Pass.

2.7 SURFACING MATERIALS

- A. Acrylic Roof Coating, Highly-Reflective Elastomeric: ASTM D6083, applied as base coat plus finish coat over prepared and primed roof surfaces.
 - 1. Solar Reflectance Index (SRI), white, ASTM E1980: 105 initial; 100 aged.
 - 2. Volatile Organic Compounds (VOC), maximum, ASTM D3960: <50 g/L.
 - 3. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D2370: 250 psi (1700 kPa).
 - 4. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D2370: 350 percent.
 - 5. Flexibility at -15 deg F (-26 deg C), ASTM D522: Pass 1/2 inch mandrel bend after 1000 hrs. accelerated weathering.
 - 6. Solids by weight, minimum ASTM D1644: >60 percent.
 - 7. Solids by volume, minimum ASTM D2697: >50 percent.

8. Color, Top Coat: White.
 9. Minimum Thickness over MB: 24 mils (0.60 mm) wet each coat for base and finish coats.
- B. Acrylic Coating Primer: acrylic-based primer formulated for use with acrylic latex coatings.
1. Asbestos Content, EPA 600 R-93/116: None.
 2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 80 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 2. Concrete Roof Deck:
 - a. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Concrete Surface Priming: Prime surface of concrete deck with asphalt primer at a rate of application recommended in writing by manufacturer for substrate type and condition.

3.3 INSTALLATION, GENERAL

- A. Install roofing system in accordance with manufacturer's written instructions, approved shop drawings, and Contract Documents.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 ROOFING INSTALLATION DETAILS

- A. NRCA Installation Details: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations; modify as required to comply with manufacturer's approved details.

3.5 SUBSTRATE BOARD INSTALLATION

- A. Comply with roofing manufacturer's written instructions for installing roof insulation.
- B. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday
- C. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
- D. Install substrate boards over decking matching height of existing roof system with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt substrate boards together. Tape joints if required by roofing manufacturer.
 - 1. Adhere substrate boards over concrete to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Mechanically fasten substrate board over the top of equipment platforms.

3.6 COLD-APPLIED ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- B. Cooperate with testing agencies engaged or required to perform services for installing roofing system.
- C. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work configured as recommended by NRCA Roofing Manual Appendix: Quality Control Guidelines - Insulation to protect new and existing roofing.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove temporary plugs from roof drains at end of each day.
 - 4. Remove and discard temporary seals before beginning work on adjoining roofing.
- D. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.7 BASE-PLY SHEET INSTALLATION

- A. Install two ply lapped modified bituminous roofing membrane base-ply sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants and onto the field of the existing roof system 8" and 16", installing as follows:
 - 1. Adhere to substrate in cold-applied adhesive.

3.8 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing membrane cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets onto the existing field of the roof 24" and up cant strips:
 - 1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
 - 2. Embed each sheet in cold-applied membrane adhesive applied at rate required by roofing manufacturer.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
 - 2. Granular Cap Sheet Laps: Apply roofing granules to cover exuded bead at laps.

3.9 FLASHING AND STRIPPING INSTALLATION

- A. Base Flashing Installation, General: Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:
 - 1. Prime substrates with primer if required by roofing system manufacturer.
- B. Backer Sheet Installation: Apply backer sheet to substrate as follows:
 - 1. Adhere backer sheet to substrate in cold-applied flashing sheet adhesive.
- C. Modified Bitumen Flashing Sheet Installation at new HVAC and Pelican Hood Curbs: Adhere flashing sheet to substrate in cold-applied adhesive. Apply cold-applied flashing sheet adhesive to back of flashing sheet if recommended by roofing manufacturer.
 - 1. Flashing Sheet Top Termination: Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 - a. Seal top termination of base flashing with a metal termination bar.
 - b. Install skirt metal counterflashing where base of equipment covers the top of base flashing.
- D. PVC Flashing Sheet Installation over Equipment Platforms:
 - 1. Fully wrap solid topped equipment platform with mechanically fastened PVC membrane.

2. Adhere flashing sheet to substrate at duct drops and other curbs in cold-applied adhesive. Apply cold-applied flashing sheet adhesive to back of flashing sheet if recommended by roofing manufacturer.
 - a. Seal top termination of base flashing with a metal termination bar.
 - b. Install skirt metal counterflashing where base of equipment covers the top of base flashing.
 3. Flash in duct supports and penetrations with PVC flashing membrane. Seal vertical edge with stainless steel pipe clamp and polyurethane sealant.
 4. Install clad edge metal system at perimeter of wood equipment platform. Secure with concrete anchors and strip in.
- E. Fluid-Applied Flashing Application: Apply base coat with embedded fabric reinforcement and top coat at penetrations in accordance with manufacturer's written instructions.
1. Apply base coat to achieve minimum wet mil coating thickness indicated in Part 2 product listing.
 2. Apply top coat over flashing base coat and spread coating evenly to achieve minimum wet mil coating thickness indicated in Part 2 product listing.
- F. Install new curb and pelican hood flashing for multiple pipes entering the same deck opening.
- G. Reinstall conduit support blocks moved during construction. Add additional blocks matching existing to insure a block every 6 feet and blocks at all changes in conduit direction and height. Set blocks on oversized cap sheet sections and loosely clamp to allow conduit movement.
- 3.10 COATING INSTALLATION
- A. Acrylic Emulsion Coating: Apply coating to new roofing membrane and base flashings in two coats, with number of coats, thickness of application, and application method as recommended in writing by coating manufacturer.
1. Prime areas with manufacturer's recommended primer prior to coating application.
 2. Extend coating 12" onto the existing coating system.
- 3.11 FIELD QUALITY CONTROL
- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.
1. Notify Owner 48 hours in advance of date and time of inspection.
- B. Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075216.13

DIVISION 23 – HVAC ALERTON EMS

SECTION 23 09 00 – HVAC ALERTON EMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building Automation System (BAS), utilizing direct digital controls. (ASCENT)

1.2 RELATED WORK

- A. Native BACnet-based system, with Microsoft Windows 10 compatible operator's workstation. Workstation, building controllers, application controllers, and input/output devices communicate using protocols and network standards per ANSI/ASHRAE Standard 135, BACnet. Workstations, controllers, and unitary controllers, to be native BACnet. Do not use gateways for controller communication. Gateways may be used to communicate with existing systems or systems installed under other sections.
 - 1. BACnet-compliant hardware and software meeting system's functional specifications. Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system.
 - 2. Individual hardware layouts, interconnection drawings, and software configuration from project design data.
 - 3. Implement detailed design for analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
 - 4. Design, provide, and install equipment cabinets, panels, data communication network cables needed, and associated hardware.
 - 5. Interconnecting cables between supplied cabinets, application controllers, input/output devices, operator's terminals and peripheral devices (including but not limited to printers) supplied under this section.
 - 6. Manufacturer's specifications for items supplied.
 - 7. Specialists and technicians; assist installation, startup, and commissioning.
 - 8. Operator and technician training program as described herein.
 - 9. As-built documentation, operator's terminal software, diagrams, and associated project operational documentation (such as technical manuals) on approved media accurately representing the final system.
 - 10. New sensors, dampers and new electronic actuators. No used components.
 - 11. Owner will have full licensing and access rights for network management and operating workstation features for ongoing maintenance and operation of BMS.
 - 12. BMS workstation will host graphic files for control system. Graphics and navigation schemes for project are to match any that are on existing site/campus.

1.3 RELATED SECTIONS

- A. Section 23 30 00 - Common Work Results for HVAC.
- B. Section 26 00 00 - Common Work Results for Electrical.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Products Supplied but Not Installed Under This Section:
 - 1. Flow switches.
 - 2. Wells, sockets and inline hardware for water sensors (temperature, pressure, flow).
 - 3. Automatic control dampers, where not supplied with equipment.
 - 4. Terminal unit controllers and actuators, when installed by terminal unit manufacturer.
- B. Products Installed but Not Supplied Under This Section: None.
- C. Products Not Furnished or Installed but Integrated with the Work of This Section:
 - 1. Smoke detectors (through alarm relay contacts).

- D. Work Required Under Other Divisions Related to This Section:
 - 1. Power wiring to line side of motor starters, disconnects or variable frequency drives.
 - 2. Provision and wiring of smoke detectors and devices relating to fire alarm system.
 - 3. Campus LAN (Ethernet) connection adjacent to Operator Workstation and Global Controller.

1.5 REFERENCES

- A. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
- B. American National Standards Institute (ANSI): ANSI/ASHRAE Standard 135, BACnet.
- C. Underwriters Laboratories:
 - 1. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
 - 2. UL 864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences.
- D. Electromagnetic Compatibility (EMC): EMC Directive 89/336/EEC (European CE Mark).
- E. The Federal Communications Commission (FCC): FCC Part 15, Subpart J, Class A.
- F. National Electrical Code (NEC).

1.6 SPECIFICATION NOMENCLATURE AND DEFINITIONS

- A. Acronyms Used in this Specification:
 - 1. ACM: Ascent Control Module.
 - 2. Actuator: Device that opens or closes damper in response to control signal.
 - 3. AI: Analog Input.
 - 4. AO: Analog Output.
 - 5. Analog: Continuously variable state over stated range of values.
 - 6. BAS: Building Automation System.
 - 7. Compass: Alerton Workstation Software.
 - 8. DDC: Direct Digital Control.
 - 9. FC: Fail closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
 - 10. FO: Fail open position of control device or actuator. Device moves to open position on loss of control signal or energy source.
 - 11. GUI: Graphical User Interface.
 - 12. HMI: Human Machine Interface.
 - 13. HVAC: Heating, Ventilating and Air Conditioning.
 - 14. LAN: Local Area Network.
 - 15. MSDB - Microsoft SQL Database
 - 16. Modulating: Movement of control device through an range of values, proportional to an infinitely variable input value.
 - 17. Motorized: Control device with actuator.
 - 18. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated dampers.
 - 19. NO: Normally open position of switch after control signal is removed; or the open position of a controlled damper after the control signal is removed.
 - 20. Operator Workstation: PC running Compass software and any required software tools applicable for day to day operation of the BMS.
 - 21. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
 - 22. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output based on both amount and duration of change in controller variable (reset control).
 - 23. PICS: BACnet Product Interoperability Compliance Statement.
 - 24. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal based on proportional error, its time history (reset) and rate at which it's changing (derivative).

- 25. Point: Analog or discrete instrument with addressable database value.
- 26. VLC: VisuaLogic Controller.
- 27. WAN: Wide Area Network.

1.7 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Construction details, layout, and location of control panels within building, including instrument location in panels and labelling. Indicate mechanical equipment associated with each controller and area in building being served by that equipment. For terminal unit control, a room schedule listing mechanical equipment tag, room number of space served, address of DDC controller, and pertinent information required for service.
 - 1. Manufacturer's data sheets on each product to be used.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Typical installation methods.
- C. Shop Drawings: Material details, construction, finish and adjacent construction relationship.
 - 1. Engineering drawings, control sequence, and bill of materials for approval.
 - 2. Standard Sizes for Drawings: 11 inches x 17 inches (ANSI B).
 - 3. Eight complete physical sets of submittal drawings, and approved electronic media.
- D. System Documentation: Include the following in submittal package.
 - 1. System Configuration Diagrams: Simplified block format. Note software addressing for device communications for devices. Indicate locations of ethernet switches.
 - 2. Input/output object listings and an alarm point summary listing.
 - 3. Electrical drawings showing system internal and external connection points, terminal block layouts, and terminal identification.
 - 4. Bill of materials, damper schedule.
 - 5. Instructions and drawings, for installation, operation, maintenance, preventive maintenance, troubleshooting, and spare parts for list control devices.
 - 6. BACnet Protocol Implementation Conformance Statements (PICS) per ASHRAE Standard 135: For system elements-Operator's Workstations, building controllers, application controllers, routers, and repeaters.
 - 7. Description and documentation of proprietary (non-BACnet) services and/or objects.
- E. Project Management: Detailed project design and installation schedule with time markings and details for hardware items and software development phases.
 - 1. Target dates for transmission of project information and documents. Indicate timing and dates for system installation, debugging, and commissioning.
 - 2. Supply products to affected trades in time to prevent interruption of construction.
 - 3. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified. Ten years documented experience and have a minimum of ten factory certified technicians on staff prior to the bid.
 - 1. BAS System: Designed, installed, commissioned, and serviced by manufacturer authorized and trained personnel. Support facility within 2 hours response time of site with technical staff, spare parts, and test and diagnostic equipment.
 - 2. Contractor: Full-time, on-site, experienced project manager responsible for supervision of design, installation, start-up and commissioning or BAS.
 - 3. Materials and Equipment: Latest standard design complying with requirements.
 - 4. UL Listed under Standard UL 916, category PAZX: BAS peer-to-peer network controllers, central system controllers and local user displays.
 - 5. Electronic Equipment: Conform to requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

6. Control System: Engineered, programmed and supported by representative's local office within 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis.
7. Installer Qualifications: Ten years documented experience with projects of similar scope and complexity.

B. Source Limitations: Each product type to be from a single manufacturing source.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene approximately two weeks before scheduled Work commencement. Attendees to include Architect, Contractor and trades involved. Agenda: Include schedule, responsibilities, critical path items and approvals.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
- B. Protect from damage due to weather, excessive temperature, and construction operations.

1.11 PROJECT CONDITIONS

- A. Maintain environmental conditions within limits recommended by manufacturer for optimum results. Do not install products in environmental conditions outside recommended limits.
1. If ambient conditions are not met at time of delivery, manufacturer reserves the right to void the warranty.

1.12 WARRANTY

- A. Manufacturer's Warranty: Limited warranty against defects in materials and workmanship. Covers costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance and applies equally to hardware and software.
1. Personnel supporting the hardware and software warranty agreement will provide on- or off-site service in a timely manner after failure notification. Acceptable Response Time: Within 24 hours, Monday through Friday; 48 hours on Saturday and Sunday.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
1. Alerton by Climatec; 2150 S. Towne Centre Pl. Ste 200, Anaheim, CA 92806.
Phone: 949-474-0955. Email: ksemaan@climatec.com
 2. Or Approved Equal.
- B. Substitutions: Not permitted. Newport Mesa District has Alerton as manufacturer at other High School Campuses as standard.

2.2 SYSTEM DESCRIPTION

- A. Except as indicated, system supplier to secure and pay for all permits, inspections, and certifications required for his work, and arrange for necessary approvals by the governing authorities.
- B. BAS: Network of interoperable, stand-alone building controllers, field controllers on logical networks, graphics and programming for complete system.
1. Password access to features, functions and data contained in BAS.
 2. Software for complete operating system, as specified, as integral part of supervisory controller. Not dependent upon higher level computer for execution.
 3. System Backup: Electronic copies of software, project graphics, setpoints, and system parameters. Backups will allow Owner to restore system if necessary.

- C. Distributed Logic Control System: Software and hardware per ANSI/ASHRAE Standard 135.
 - 1. System controls mechanical equipment, including unitary equipment such as VVT boxes, roof top units, and listed equipment using native BACnet-compliant components.
 - 2. Operator's Workstation Software: BAS application written utilizing BACnet protocols. Software functions to include password protection, scheduling, alarming, logging of historical data, full graphics including animation, after-hours billing, demand limiting, and full suite of field engineering tools including graphical programming applications.
 - a. Programming to make future changes to the system, controllers, field level devices, system changes, scheduling, and trending.
 - b. Field engineering tools, graphical programming and applications.
 - 3. Building Controllers: Building management software, with scheduling building control strategies and optimum start and logging.
 - a. Energy Management Software/Firmware: Resident in field hardware.
 - b. Operator's Terminal Software: Used to access field-based building management functions. Zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.
 - 4. Room Sensors: Viewable digital readout of room temperature, CO2 and outside air. Adjustable room setpoint within preset limits and set desired override time. Start and stop unit from digital sensor. Include wiring and firmware for field service mode allowing technicians to balance VVT zones and access parameters in zone controller directly from room sensor. Field service mode must have ability to be locked out.
 - 5. Application Controllers: Terminal units including VVT, RTU and other controlled equipment to be programmable. Mount next to controlled equipment. Communicate with building controller through BACnet LAN.

2.3 OPERATOR WORKSTATION

- A. Software: Integrate to existing District Compass software.
- B. Operator Workstation: Utilize existing District workstation.
- C. Sufficient storage to accommodate fully configured point databases, application databases, graphics files, user-defined reports, and historical data archived as specified.
- D. Graphic Based Displays: For each system.
 - 1. Operator Workstation: Point data for each system. Update every 30 seconds.
 - 2. Dynamically update data any action by user.
 - 3. Graphic Displays: Iconic graphic representations of mechanical equipment. Display graphic files, text, trendlog, and dynamic object data displays including animation.
 - 4. Graphic Displays: "Drill Down" capability from main display to more specific system displays or navigation tree for building equipment and system diagnostic centric display organization.
 - a. Tree Navigation Contents: Customizable per-user and per-group basis.
 - 5. Systems with Terminal Unit Controls: Building floor plan with dynamic temperatures, drillable for more specific terminal information.
 - 6. Points on graphics allow user to change field-resident Operator Workstation functions associated with project, including setpoints, weekly and exception schedules, from any screen, whether screen shows text or graphic display. Do without reference to object addresses or other numeric/mnemonic indications.
 - 7. Protect display views unless operator credentials have proper access level. Assign access levels to each display/system object. Menu labels not to appear on graphic if operator does not have appropriate security level.
 - 8. Analog objects: Displayed with operator modifiable units. Input objects may be displayed as graphic items on display screen as an overlay to the system graphic.
 - 9. Information: Labeled with descriptors and shown with appropriate engineering units.
 - 10. DDCs system must provide graphic displays and files. Systems requiring graphics development or logic programming are prohibited. Graphic Files: JPG, GIF or PNG.
 - 11. Submit graphic displays to Owner for review and approval. Approved graphics to be in place prior to commissioning.
 - 12. Operator Workstation: Supply graphics library, to use unaltered or modified. Include library to

- assemble custom graphics. System to allow creation of new graphics.
- 13. Data Displays: Ability to link to content outside of BAS system. Content to include, but not limited to launching external files in their native applications.
- E. Graphics: Graphics to match existing.
- F. The Operator Interface: Support the following functions.
 - 1. Mouse-over tooltip information of graphic items or data points; can be turned off.
 - 2. Right click capability to access system functionality such as Schedule, Trendlogs, and Alarms associated with display object selected.
 - 3. Automatic zooming to screen size to maximize display to display area. Can be enabled or disabled. Background color, flood fills remaining screen background.
 - 4. Support user configurable embedded Data Viewer for a persistent trend log data view to accompany system data and graphic information on a single display.
- G. Password Protection: Preventing unauthorized use unless operator is logged on.
 - 1. Limits operator to assigned functions when logged on. Includes displays as outlined.
 - 2. Users: Individual User IDs, User Names, and Passwords. Case sensitive alphanumeric character entry except for User ID. User ID, User Name, and Password will enforce minimum of 8 characters and stored in encrypted format.
 - 3. Each user to be allowed individual assignment of control functions, menu items, navigation tree, and user-specific system start display, and restricted access to discrete BACnet devices to which user requires access.
 - 4. Passwords, user names, and access assignments: Adjustable via Compass. Password adjustable via web client.
 - 5. Users to have set access levels, which define access to displays and individual objects user may control. System to have 10 distinct access levels for assignment.
 - 6. Operator Workstation and Web Client: Auto logout feature when no keyboard or mouse activity is detected for time period, adjustable by system administrator. Enabled and disabled by system administrator. Screen message notifying log out.
 - 7. Permit effective date range, and effective time of day, User are permitted access.
 - 8. Operator Workstation: Support LDAP integration enforcing strong password policies.
- H. Operator Activity Log: Tracks operator changes and activities.
 - 1. Included in Operator Workstation. A log of what changed, who made the change, date and time of system activity, and value of change before and after. Operator may display activity, sort changes by user or operation and print Operator Activity Log.
 - 2. Activity log to be gathered and archived to MSDB as needed. Log to be able to exportable for spreadsheet display and sorting.
 - 3. User option to record commenting in Operator Activity Log upon system point change.
 - 4. Accessible via Web Client for viewing, sorting, filtering, and printing.
- I. Scheduling:
 - 1. Information to be in easy-to-read daily format including calendar of this month and next. Schedules to show actual ON/OFF times for day based on scheduling priority. Priority for Scheduling: Events, holidays and daily, with events being the highest.
 - 2. Holiday and Special Event Schedules: Display data in calendar format. Be able to schedule holidays and special events directly from these calendars.
 - 3. Operator to be able to change information for a given weekly or exception schedule if logged on with appropriate access privileges.
 - 4. Schedule Wizard for schedules set up. Walks user through schedule generation. Have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.
 - 5. Scheduling: Include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and previous starts history. Individual zones to have optimum start time calculated based on parameters listed. Operators to input schedules to set time that occupied setpoint is to be attained. Optimum start feature must calculate the startup time needed to match zone temperature to setpoint. Operators to be able to set a limit for maximum startup time allowed.
 - 6. List show currently defined schedules. Includes standard, holiday and event schedules. User to

- 7. be able to select a list showing scheduled points and zones.
 - 7. Display of schedules must show ON times for standard, holiday and event schedules in different colors on a given day. OFF times must also be shown in additional colors. Operators may select from a calendar what days are to be scheduled and show points and zones affected. Operators may set time for one day and then match it to days of the week to be affected as a recurrence of same schedule.
 - 8. Any displayed data that is changeable by operator may be selected using the right mouse button and schedule selectable on screen. Selection of schedule using this method allows viewing of assigned schedule and allows the point to be scheduled.
 - 9. Schedule Support Functions: Drag-n-drop events and holidays on schedule calendar.
 - a. Drag-n-drop events default to two-hour period; can operator adjusted.
 - b. Drag-n-drop holidays default for OFF all day; edit for multiple-day holidays.
 - c. View affected zones when adding or editing timed events of a schedule.
 - 10. Web Client: A search list of scheduled points and zones to access schedule calendar.
 - 11. Schedule Time Blocks: Present schedule detail via mouse-over information.
- J. Advanced Scheduling:
- 1. Each resource shall have its own unique schedule object.
 - 2. Both analog and binary points shall be scheduled.
 - 3. Holiday schedules shall support perpetual holidays
 - 4. Calendar Events Set to be Reoccurring Events: Daily, weekly, monthly and annually as well as a non-pattern occurrence by selecting groups of days so they can be edited on one occurrence.
- K. Alarm Indication and Handling: Visual, printed, and email means of alarm indication.
- 1. Printout of Alarms: Sent to assigned terminal and port. May be filtered based on User ID's authorization level.
 - 2. Web Client: Display persistent alarm state for system regardless of data view including points in alarm but not acknowledged, and points that have gone into alarm and returned to normal without being acknowledged.
 - 3. Recorded and archive at the Operator Workstation:
 - a. Description of event and equipment initiating alarm. 256 characters in length.
 - b. Time and date of alarm occurrence.
 - c. Time and date of object state return to normal.
 - d. Time and date of alarm acknowledgment
 - e. Identification of operator acknowledging alarm.
 - 4. Alarm messages: User-definable text, English or other specified language, and delivered to operator's terminal, client, or remote communication using email; authenticated SMTP supported.
 - 5. Allow for set up of alarms. User interface will walk user through steps necessary.
 - 6. Alarm annunciation includes navigation link to a user-selected display or URL.
 - 7. Displayed data changeable by operator is right mouse button selectable. Alarm is then selectable on screen allowing view of alarm history or allow new alarm creation.
- L. Trendlog Information: Display trendlog records in standard engineering units.
- 1. Periodically gather data stored in building controllers and store information in system database. Append stored records with new data. Overwriting records is not allowed unless file size is limited. System database shall be capable of storing up to 30,000 records before needing to archive data. Samples viewable at Web Client.
 - a. Capable of trending on interval determined by polling rate, or change-of-value.
 - 2. Add and edit trendlogs and setup information including the following:
 - a. The interval at which it is to be logged.
 - b. Operations shall be password protected.
 - c. Accessed directly from graphics on which a trended object is displayed.
 - 3. Trendlog Wizard: Setup of multiple trend logs simultaneously. Walk users through necessary steps. Have a pull-down selection for startup, or by right-clicking on value displayed on graphic, and then selecting Trendlogs from displayed menu.
 - 4. Trendlog Data: Viewable on Datalogger accessible via Web Browser. Trend logs of any point on a graphic must be initiated by performing a right mouse click on the point.
- M. DataViewer access via Web Browser: Capable of graphing trend-logged object data.

1. Access and ability to create, edit and view are restricted by user account credentials
 2. Specific and repeatable URL defines trendlog views for browser bookmarking and email compatibility.
 3. Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
 4. Trendlog or Energy log and companion logs configurable to display on one of two independent vertical scales embedded in display.
 5. Click zoom for control of data set viewed along either graph axis.
 6. User-specifiable start and end dates and fast scroll features supporting click zoom of macro scale view of data for quickly finding data set based on visual signature.
 7. User export of the viewed data set to MS Excel.
 8. Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.
- N. Energy Log Information: Display information in standard engineering units.
1. Periodically gather energy log data in field controller and archive information. Append files with new data. Overwriting archived data is not allowed unless file size is limited.
 2. Store data in database format for use by third-party programs. System operation to stay online during graphing operations.
 3. Operators to be able to change energy log setup information. Includes meters, meter pulse value, and type of energy units. Meters monitored by system may be logged. Support using flow and temperature sensors for BTU monitoring.
 4. Web Client: Display data in tabular and graphical formats. Display in hourly, daily, weekly, monthly and yearly formats. Be able to select specific data periods to view.
- O. Demand Limiting: Sheds and restores equipment based on energy usage when compared to shed and restore settings.
1. Shedding: Implemented independently on each zone or piece of system equipment.
 2. Binary Shedding: 5 priority levels. Loads in a given priority level to be shed before any loads in a higher priority level are shed. Load shedding within a given priority level includes two methods; a "first off-first on" mode, and a "first off-last on" linear mode.
 3. Analog Shedding: Program generated ramp used by individual zones or control algorithm to raise and lower cooling and heating settings reducing energy usage.
 4. Status of each program to be displayed with description of each load on Web Client.
- P. Tenant Activity: A program monitoring after-hours overrides by tenants, logs data, and generates bill based on usage and rate charged for each tenant space.
1. Tenant after-hours override usage is logged in Operator Workstation database.
 2. Include entry of following information for use in logging and billing.
 - a. Tenant's contact name and address.
 - b. One or multiple tenant zones making up a total tenant space, including separate billing rate for each separate zone.
 - c. Minimum and maximum values an event duration and event limit.
 - d. Property management information.
 - e. Overall billing rate.
 - f. Seasonal adjustments or surcharge to billing rate.
 - g. Billing notification type including, but not limited to printer, file and email.
 - h. Billing form template.
 3. Logging: Include recording the following information for each and every tenant event.
 - a. Zone description.
 - b. Time the event begins.
 - c. Total override time.
 - d. Limits shall be applied to override time.
 4. A Tenant Bill: Generated for a specific period using entered configuration data and logged data. User with appropriate security level will be able to view and override billing information. User to be able to select a billing period to view and be able to delete events from billing and edit a selected tenant activity event's override time.
- Q. Reports: Capable of producing the following reports. Deliverable Format: CSV.
1. Trendlog configurations.
 2. Alarm configurations.
 3. Tenant activity configurations.

4. Device summary.
 5. Energy log configurations.
 6. Schedule configurations.
 7. Deliverable Format: CSV files.
- R. Field Engineering Tools: For programming controllers supplied.
1. Database Application Manager: Include controller logic files and associated graphics.
 2. Device Manager: Detect devices connected on BACnet network by scanning. Display device instance, network ID, model, and description. Record and display software file loaded in each controller. Store file copies in project folder on computer's hard drive.
 3. Audit when device not in database is added to network.
 4. Backup/restore function for system to selected medium. System to be capable of restoring systems and creating a backup for instantiating a new client PC.
 5. A means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.
- S. Web Interface: System software based upon server/thin client architecture, designed around open standards of web technology.
1. Communicate using Ethernet and TCP. Access server using a web browser across Owner's intranet and remotely via the Internet. Support 200 users with single license.
 2. Web Browser: Microsoft Internet Explorer v11 or later, Firefox 70 or later, Chrome 78 or later, and Safari 13 or later. No special vendor-supplied software to be required. Display data in real-time. Update automatically without user interaction.
 3. Web Pages: Automatically generated with HTML5 from data display files on Operator Workstation. Do not use systems requiring an HTML editor for web page generation.
 4. Launching Web Browser on Operator Workstation presents a login page requiring a login name and password. Navigation and system adjustments dependent upon operators assigned privileges. User activity reports will show activity of operators, whether changes were made using a web client or Operator Workstation.
 5. User Session Management including ability to view connected user sessions to the web client, see how long they have been active/inactive for each unique session, and force log-out for any or all sessions.
- T. Context Menu Navigation: Web Browser: Support Context Menu Navigation via a right mouse click on a data point.
1. Operations to be dependent upon logged in user privileges and include:
 - a. View and setup Alarms.
 - b. View and setup Trend Logs.
 - c. Display the BACnet properties for the selected Object.
 - d. View and setup Schedules.
 - e. View System activity for the selected Object.
- U. Summary Pages:
1. Present system data in tabular form. Data to be from multiple devices. Points presented horizontally and devices listed on left side of table.
 2. Built using spreadsheet that can be imported into Operator Workstation.
 3. Data in summary pages to be live. Configure each object to be read only or writeable.
 4. Both analog and binary data shall be supported.
 5. Summary page, when populated, captured for archiving and review for analysis.
 6. The data shall be sortable by clicking on the column headings.
- V. Advance Scheduling (EASE): Managed and arranged in multi-tier hierarchy.
1. Access through hierarchy to be controlled via login credentials.
 2. Configured for MS SQL 2014/17/19 Enterprise.
 3. The Advanced Schedule Application:
 - a. Apply conflict resolution logic for effective scheduling.
 - b. Assign Work, Week and Holiday schedules for multiple resources.
 - c. Create schedules with analog and binary resources.
 - d. Create events for parent resources or children using inheritance.
 - e. Customize event recurrence.

- f. Use Resource Picker to search and select resources.
- g. Create custom templates to hold the resource and event time.
- h. Schedule Operations Status: Use notification banner. Verify changes in resource tree.
- i. Verify event type applied to resource with indication given by resource hierarchy/tree.

2.4 BUILDING CONTROLLER (ACM)

A. General Requirements:

1. BACnet Conformance: Approved by BTL as meeting BACnet Building Controller requirements.
 - a. Refer to ANSI/ASHREA 135, for a complete list of the services that must be directly supported to provide each of the functional groups listed above.
 - b. Proprietary services, if used, document and provide as part of submittal data. Provide tools for working with proprietary information.
2. Scalable: Number of trunks and protocols selectable to fit project requirements
3. Capable of panel-mounting on DIN rail and/or mounting screws.
4. Global control strategies based on information from any objects in system, regardless if object is directly monitored by building controller module or by another controller.
5. Capable of running 6 independent control strategies simultaneously. Modification of one control strategy does not interrupt function or runtime others.
6. Software implementing DDC strategies to be completely flexible and user-definable.
7. Software Programming Tools: Provide as part of project software. Factory pre-programmed global strategies not modifiable by field personnel are not acceptable. Changing global strategies via firmware changes is also unacceptable.
8. Programming: Object-oriented control function blocks and support DDC functions. Flowcharts: Generated and automatically downloaded to controller. Programming tool to be resident on workstation. used same tool for controllers.
9. Graphically view inputs and outputs to each program block in real-time as program is executing. Function may be performed using operator's workstation or field computer.
10. Controller: 6,000 Analog Values and 6,000 Binary Values.
11. Controller IP configuration: Via direct USB connect or field computer.
12. Quad Core 996 Ghz processor to ensure fast processing speeds.
13. Execute control algorithms and automated control functions with 64-bit processor.
14. Minimum of 1 GB of DDR3 SDRAM on a 533 Mhz bus to ensure high speed data recording, large data storage capacity and reliability.
15. Support 2 on-board EIA-485 ports capable of supporting various EIA-485 protocols including, but not limited to BACnet MS/TP and Modbus. Ports capable of supporting EIA-485 protocols including, to BACnet MS/TP and Modbus.
16. Support 2 ports-each of gigabit speed-Ethernet (10/100/1000) ports. Ports are capable of supporting Ethernet protocols including, BACnet IP, FOX, and Modbus.
17. Ports capable of having protocols assigned to utilize port's physical connection.
18. Minimum 4 onboard inputs, 2 universal inputs and 2 binary inputs.
19. Schedules:
 - a. Normal seven-day scheduling, holiday scheduling and event scheduling.
 - b. Support 380 BACnet Schedule Objects and 380 BACnet Calendar Objects.
20. Logging Capabilities:
 - a. Log 2,000 objects at 15-minute intervals. Any object in system may be logged. Sample time interval adjustable at operator's workstation.
 - b. Viewed logs on-site or off-site using WAN or remote communication.
 - c. Periodically upload trended data to operator's workstation for archiving. Archived data available for use in spreadsheet or database programs.
21. Alarm Generation: Within the system for any object change of value or state, includes analog and binary object state changes, and controller communication failures.
 - a. Each alarm may be dialed out as noted elsewhere.
 - b. Provide alarm log for alarm viewing. Log may be viewed on-site at operator's terminal or off-site using remote communications.
 - c. Handle up to 2,000 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.
22. Demand Limiting of Energy: Built-in, user-configurable function.
 - a. Controller modules support shedding up to 1,200 loads.
 - b. Load shedding programs to operate as defined herein.

23. Tenant Activity Logging: Supported by a building controller module. Each independent module to support a 380 zones.
 - a. Tenant Activity logging to function as defined herein.
- B. BACnet MS/TP:
 1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4 Kbps
 - a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum.
 - b. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.
- C. BACnet IP:
 1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the local area network (LAN).
 2. Must support interoperability on WANs and campus area networks (CANs), and function as a BACnet Broadcast Management Device (BBMD).
 3. Each controller shall support at a minimum 128 BBMD entries.
 4. BBMD management architecture shall support 3,000 subnets at a minimum.
 5. Shall support BACnet Network Address Translation.
 6. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.
- D. Expansion Ports:
 1. Controller shall support two (2) expansion ports.
 - a. Combining the two on-board EIA-485 ports with fully loaded expansion ports, the controller shall support six (6) EIA-485 trunks simultaneously.
 2. Expansion Cards: Mate to the expansion ports, shall include the following.
 - a. Dual port EIA-485 card.
 - b. 78 kbps FTT10A LON network card.
- E. Modbus Protocol Support:
 1. Controller shall support reading from and writing to TCP Slaves and Serial Connections (RTU or ASCII over either EIA-485 or EIA-232).
 - a. Shall be capable of mapping Modbus register coil data to BACnet AV, BV, MV, AI, BI, and MI object types.
 - b. Support a minimum of 6000 Mapped Modbus points.
 2. Support up to 384 virtual groupings of Modbus points where each grouping is represented as a single virtual BACnet device.
 - a. Virtual BACnet devices support BACnet Change Of Value (COV) notifications
 - b. Each Virtual device has diagnostic information for troubleshooting Modbus point mapping. Diagnostic point should include the following.
 - 1) Number of points mapped.
 - 2) Number of messages Transmitted and Received.
 - 3) Modbus Exception Counts.
 - 4) Display of last exception message.
 - 5) Serial Setting (Baud rate, Parity, Stop Bits).
 3. Integration Performance: Data age of integrated point shall be capable of 1 second for 5000 points.
- F. Niagara Framework:
 1. Controller shall utilize the Tridium Niagara Framework.
 - a. Niagara Framework shall be version 3.8 or newer.
 - b. Niagara licensing shall be stored on a removable MicroSD card for fast in-field replacement of controller.
 2. The Niagara License for the controllers shall be an open license.
 - a. The controller shall be programmable via Niagara Workplace programming tool.
 - b. The controller shall be programmable via a Niagara embedded Workplace programming

tool.

- G. Power Supply:
 - 1. Input for power: Accept between 17 and 30 VAC, 47 and 63 Hz.
 - 2. On-board capacitor ensuring continuous operation of real-time clocks for 14 days.
- H. Controller: Shall be in compliance with the following.
 - 1. UL 916 for open energy management.
 - 2. FCC Class B.
 - 3. RoHS Compliant.
 - 4. IEC 60703.
 - 5. C-Tick Listed.
 - 6. CE(EN 60730-1).
- I. Controller: Operate in the following environmental conditions.
 - 1. Without Battery: Minus 4 to 149 degrees F (Minus 20 to 65 degrees C).
 - 2. With Battery: 32 to 122 degrees F (0 to 50 degrees C).
 - 3. Relative Humidity: 0 to 95 percent, non-condensing.

2.5 AIR HANDLER APPLICATION CONTROLLERS

- A. General Requirements:
 - 1. One or more native BACnet application controller for each air handler as needed for control to adequately cover objects listed in object list.
 - 2. Interface to building controller through MS/TP LAN using BACnet protocol, or Ethernet LAN using BACnet over Ethernet or BACnet TCP/IP. Do not use gateways.
 - 3. Include input, output and self-contained logic program as needed for complete control of units. Fully programmable using graphical programming blocks. Resident programming tool on operator workstation. Same tool used for building controller. Do not use auxiliary or non-BACnet controllers
- B. BACnet Conformance:
 - 1. Approved by BTL meeting BACnet Advanced Application Controller requirements.
 - 2. Refer to ANSI/ASHREA 135, for a complete list of services directly supported to provide each of the functional groups listed. Proprietary services, to be documented and provided in submittal data. Supply tools for working with proprietary information.
 - 3. Object types supported include, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Multi-state Values, Device, File, and Program object types. Proprietary types, to be documented and provided in submittal data. Supply tools for working with proprietary information.
- C. Direct Digital Controls:
 - 1. Include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0 to 10 VDC, Platinum 1000 ohm RTD, 0 to 5 VDC, 4 to 20 mA and dry contact signals. Inputs on controllers may be analog or digital. A minimum of 3 inputs that accept pulses. Include binary and analog outputs on board. Analog outputs with 12-bit resolution to support either 0 to 10 VDC or 0 to 20 mA. Binary outputs: LED indication of status. Software must include scaling features for analog outputs. Include 20 VDC for use as power supply to external sensors.
 - 2. Outputs must have onboard Hand-Off-Auto (HOA) switches and status indicator light. Monitor HOA switch position. Analog outputs will include potentiometer for manual adjustment of output when HOA switch is in Hand position.
 - 3. Every HOA switch position to be available system wide as a BACnet object property.
- D. Programmable Controller:
 - 1. Program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. Program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. Calculations shall be completed using floating-point math and system shall support display of information in floating-point nomenclature at operator's terminal.
 - 2. The following control blocks shall be supported.

- a. Natural Log.
 - b. Exponential.
 - c. Log base 10.
 - d. X to the power of Y.
 - e. Nth square root of X.
 - f. 5th Order Polynomial Equations.
 - g. Astronomical Clock (sunrise/sunset calculation).
 - h. Time based schedules.
 3. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in Operator's Workstation section.
- E. Schedules: The controller shall support a minimum of 3 BACnet Schedule Objects and have a real time clock on board with battery backup to maintain time through a power loss.
- F. Logging Capabilities:
1. Controller shall support a minimum of 50 trendlogs. Any object in the controller (real or calculated) may be logged. Sample time interval shall be adjustable at the Operator's Workstation.
 2. Controller shall periodically upload trended data to system server for long-term archiving if desired. Archived data stored in SQL database form and shall be available for use in third-party spreadsheet or database programs.
- G. Alarm Generation:
1. Alarms may be generated within the controller for any object change of value or state (either real or calculated). This includes things such as analog object value changes, and binary object state changes.
 2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
 3. Controller must be able to handle up to 25 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.
- H. Power Supply:
1. Input for power shall accept between 17 and 30 VAC, 47 and 63 Hz.
 2. Power Input/Output expansions separate and shall be 24 VAC 50/60 Hz, 20 VA minimum and half-wave rectified. Output loads are powered separately.
 3. Optional rechargeable battery for shutdown of controller including storage of data in flash memory.
 4. On-board capacitor will ensure continuous operation of real-time clocks for minimum of 14 days.
- I. Controller: Shall be in compliance with the following.
1. UL 916 for open energy management
 2. FCC Part 15 Class B
 3. ICES-003 Issue 6
 4. EN 60703-1
- J. The controller processor shall be a 64-bit processor.
- K. The packaging of the controller shall provide operable doors to cover the terminals once installation is complete. The housing of the controller shall provide for DIN rail mounting and also fully enclose circuit board.

2.6 TERMINAL UNIT APPLICATION CONTROLLERS

- A. General Requirements:
1. One native BACnet application controller (B-ASC) for each piece of unitary mechanical equipment that adequately covers objects listed in object list for unit.
 2. Interface to building controller through MS/TP LAN using BACnet protocol. No gateways to be used. Controllers to include input, output and self-contained logic program as needed for com-

- plete control of unit.
 3. Microprocessor-based, multi-tasking, real-time digital control processor. Each controller shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network.
 4. Sufficient memory to support system setpoints, proportional bands, control algorithms, and other programmable parameters shall be stored such that a power failure of any duration does not necessitate any reprogramming. Each application controller shall return to normal operation upon restoration of power.
 5. Setpoint and input/output point data shall be accessible through any operator workstation, web browser and building controllers.
 6. Ability to download and upload configuration data via the operator workstation.
 7. One copy of any programming tool required to configure or program the controllers shall be provided to the Owner along with appropriate documentation.
 8. Include universal inputs accepting 3K and 10K thermistors, 0 to 5 VDC, 4 to 20 mA, dry contact signals and a minimum of 3 pulse inputs. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.
 - a. Resolution: 10 bit.
 9. Ambient Space Rating: 0 to 158 degrees F and 5 to 95 percent RH.
 10. Include support for intelligent room sensor. Display on room sensor to be programmable at controller and include an operating and field service mode. Button functions and display data to be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.
- B. BACnet Conformance:
1. As a minimum, support MS/TP BACnet LAN types. They shall communicate directly using this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as a native BACnet device. Application controllers shall be approved by the BTL as meeting the BACnet Application Specific Controller requirements and support BACnet services necessary to provide the following BACnet BIBBs:
 - a. Data Sharing - DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B.
 - b. Device and Network Management - DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-TS-B, DM-RD-B.
 2. Refer to ANSI/ASHRAE Standard 135, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. Proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data.
 3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program Object Types. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.
 4. Application Controllers:
 - a. BACnet Protocol Implementation Statements per ANSI/ASHRAE Standard 135.
 - b. Conform to FCC Part 15, Subpart J, Class A.
- C. Custom Programs: Standalone application controllers for, but not limited to, the following application types: Custom Air Handling Units.
- D. Application Specific Controllers:
1. Support, but not limited to, the following system types to address specific applications: Rooftop Air Handlers, VAV terminal units and Fan Coil Units.
 2. Application Specific Descriptions:
 - a. VAV/CAV Unit Application Controllers:
 - 1) One native BACnet application controller for each VAV box covers objects listed in object list for unit. Interface with building controller via MS/TP LAN using BACnet protocol. Do not use gateways. Include on board CFM flow sensor, inputs, outputs and programmable, self-contained logic program as needed for control of units.
 - 2) Support, but not be limited to, control of the following configurations of VAV boxes to address current requirements described in Execution portion of specifica-

- tion, the operational sequences described in Division 23, and for future expansion:
 - a) Single duct, cooling only with or without reheat.
 - b) Dual duct.
 - c) Fan powered (series or parallel).
- 3) Support the following types of inputs and outputs:
 - a) Variable Air Volume control outputs.
 - b) Reheat control outputs.
 - c) Air Flow Inputs (maybe calculated from velocity inputs).
 - d) Space temperature inputs.
 - e) Analog space temperature setpoint.
 - f) Binary unoccupied override inputs.
- 4) Operation modes supported by VAV Terminal Unit Controllers:
 - a) Daily/Weekly schedules.
 - b) Occupancy mode.
 - c) Unoccupied mode.
 - d) Temporary override mode.
- b. Fan Coil Unit Controls:
 - 1) Support, but limited to operational sequences described in Division 23.
 - 2) Support the following input and output types:
 - a) Modulated heating and cooling control outputs.
 - b) Space temperature inputs.
 - c) Analog space temperature setpoint adjustment inputs.
 - d) Binary unoccupied override inputs.
 - 3) Modes of operation supported by Fan Coil Unit Controllers:
 - a) Daily/weekly schedules.
 - b) Occupancy mode.
 - c) Unoccupied mode.
 - d) Temporary override mode.

2.7 ELECTRONIC CONTROL DEVICES

- A. Temperature Sensors (Microset 4): Solid-state electronic, interchangeable with housing appropriate for application. Wall sensors: Install as indicated on drawings. Mount 48 inches (1219 mm) above finished floor. Duct sensors: Install so sensing element is in the main air stream. Immersion sensors: Install in wells. Immersion wells to be filled with thermal compound before installation of immersion sensors. Outside air sensors: Install away from exhaust or relief vents, not in an outside air intake, and in a shaded location.
- B. Intelligent Room Sensor with Touchscreen:
 - 1. General Requirements:
 - a. Backlit touchscreen LCD digital display.
 - b. Temperature sensor.
 - c. Humidity sensor.
 - d. Programmable Status Light indicator.
 - e. CO2 sensor or BACnet MS/TP communication up to 115.2 kbps.
 - f. Interact with smart sensor using a touchscreen, with no buttons allowed.
 - g. Tamper proof installation requiring tools to be removed from the wall.
 - h. Touchscreen: Surface hardness of Mohs 7 or greater preventing scratching.
 - i. Controller: Function as room control unit, and allow occupant to raise and lower setpoint, and activate terminal unit for override use-all within limits as programmed by building operator.
 - 2. Space Temperature Sensor: Uni-Curve Type II thermistor. Accuracy: Plus or minus 0.36 degrees F (0.3 degrees C) at calibration point over range of 32 to 158 degrees F.
 - 3. Humidity Sensor: Accuracy: Plus or minus 3 percent from 10 to 90 percent relative humidity (RH) or better, non-condensing.
 - 4. Status Light indicator: A minimum of 4 colors, blue, red, amber, and green. Will cast a glow on-to wall below sensor to be used as visual indicator to occupants of system condition. Color and on/off state of Status Light indicator to be fully programmable.
 - 5. CO2 Sensor: Accuracy: Plus or minus 30 ppm over range of 0 to 5000 ppm.

- a. Automatic Baseline Correction maintains calibration. No manual calibration.
6. Display Content:
 - a. Intelligent room sensor:
 - 1) Simultaneously display room setpoint, room temperature, and outside temperature at each controller.
 - 2) Ability to add or remove time-of-day, room humidity, and indoor air temperature to customize view for customer. Must have the capability to show temperatures in degrees Fahrenheit or degrees Celsius.
 - 3) Display status of a lighting zone and control on/off state of zone from touchscreen using a tenant-accessible display page.
 - 4) Display status of window zone (e.g., blinds) and control on/off state of zone from touchscreen using a tenant-accessible display page.
 - b. A communication loss or improper communications wiring to be displayed on the LCD screen to aid in trouble shooting.
 - c. Firmware version information to be displayable on the LCD screen.
 - d. Cleaning mode: Allow cleaning of touchscreen.
7. After Hours Override:
 - a. Be set and viewed in 30-minute increments.
 - b. Override countdown: Automatic, but can be reset to zero by from the sensor.
 - c. The remaining time shall be displayed.
 - d. Display "OFF" in unoccupied mode unless a function button is pressed.
8. Configuration Modes:
 - a. Intelligent Room Sensor: Service technician access to hidden functions for advanced system configuration. Functionality accessed-protected with a configurable PIN number.
 - b. Field Service Mode shall allow access to common parameters as dictated by application's sequence of operations. Parameters shall be viewed and set from intelligent room sensor with no computer or other field service tool needed.
 - c. If the intelligent room sensor is connected to VAV controller, Balance Mode shall allow a VAV box to be balanced and air flow parameters viewed. The balancing parameters shall be viewed and set from the intelligent room sensor with no computer or other field service tool needed.
9. Conformance: Intelligent Room Sensor to be in compliance of the following:
 - a. UL Standard for Safety 916.
 - b. FCC Part 15.107 and 109, Class B, CFR47-15.
 - c. EMC Directive 89/336/EEC (European CE Mark).

2.8 INTERCONNECTING WIRE AND CABLE

- A. Wiring regardless of service or voltage will comply with Contract Document Division 26 Project Electrical System Specifications, the National Electric Code (NEC), and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ).
- B. Where required, wiring, regardless of service or voltage, to be in conduit per Division 26 and routed parallel to or at right angles with the structure. Properly support every 6 ft (1829 mm).
- C. Where permitted by local guides, NEC and AHJ; use plenum-rated control cabling where final application will be concealed but accessible. Where plenum-rated cable is allowed, route parallel to or at right angles with the structure. Support every 6 ft (1829 mm).
- D. The BAS Wiring:
 1. 24 VAC Power: Red/Black jacketed conductors; black jacketed sheath over the pair.
 2. Input/Output – White/Black jacketed conductors; white jacketed sheath over the pair.
 3. Communication: White/Black jacketed conductors; blue jacketed sheath over the pair.
- E. BMS Line Voltage Power Source
 1. 120-volt AC circuits used for the Building Management System shall be taken from panel boards and circuit breakers provided by Division 26.
 2. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.

3. DDC terminal unit controllers may use AC power from motor power circuits or associated controlled equipment.

2.9 ELECTRONIC ACTUATORS

- A. Quality Assurance for Actuators:
 1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
 2. NEMA 2 rated enclosures for inside mounting. Weather shield for outside mounting.
 3. Five-year manufacturer's warranty. Two-year unconditional and three-year product defect from date of installation.
- B. Execution Details for Actuators:
 1. Freeze-stat and "Hard Wire" interlock to disconnect mechanical spring return actuator power circuit; fail-safe operation. Do not use control signals to drive actuators closed.
 2. DDC analog output points to have an actuator feedback signal, independent of control signal, wired and terminated in control panel for true position information and troubleshooting. Or wire the actuator feedback signal to DDC as an analog input for true actuator position status.
 3. VAV box damper actuation to be floating type or analog (2 to 10 VDC, 4 to 20 mA).
- C. Actuators for damper. Electric unless otherwise specified. Provide as follows:
 1. UL Listed Standard 873 and Canadian Standards association Class 481302/
 2. Enclosures: NEMA 2 rated for inside mounting. Weather shield for mounting outside.
 3. Five-year manufacturer's warranty. Two-year unconditional and Three year product defect from date of installation.
 4. Mechanical Spring: When specified. Do not use non-mechanical fail-safes.
 5. Position indicator device installed visible to exposed side of actuator. For damper short shaft mounting, provide a separate indicator to exposed side of actuator.
 6. Overload Protection: Protection against burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit to insure actuators cannot burn out due to stalled damper or mechanical and electrical paralleling.
 7. A Pushbutton gearbox release shall be provided for non-spring actuators.
 8. Modulating actuators shall be 24 VAC and consume 10 VA power or less.
 9. Conduit connectors are required when specified and when code requires it.
- D. Damper Actuators:
 1. Outside air and exhaust air damper actuators: Mechanical spring return. Do not use non-mechanical forms of fail-safes. Mounting arrangement and spring return feature to permit normally open or normally closed positions of damper.
 2. Economizer Actuators: Analog control 2-10 VDC. Floating control is not acceptable.
 3. Electric damper actuators (and VAV box actuators): Direct shaft-mount. Use V-bolt and toothed V-clamp for positive gripping.
 4. One electronic actuator direct shaft-mounted per damper section. No connecting rods or jack-shafts. Small outside and return economizer dampers may be mechanically linked if one actuator has sufficient torque to drive both horizontal drive shafts.
 5. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft-mounted per damper section. (See below execution section for more installation details.)
- E. Control Dampers.
 1. Modulating Service: Opposed blade type. Arrange for normally open or closed operation. Size damper so when wide open, pressure drop is a sufficient amount of its close-off pressure drop for effective throttling.
 2. Two-position or open-close control: Parallel blade type. Arrange for normally open or closed operation as required.
 3. Alignment plates for multi-section dampers.
 4. Linkage Hardware: Aluminum or corrosion-resistant zinc and nickel-plated steel.
 - a. Bearing support bracket and drive blade pin extension for each damper section. Permanent indication of blade position by scratching or marking visible end of drive blade pin extension.

- b. Drive Pin: May be round if V-bolt and toothed V-clamp is used for positive gripping. For single bolt or set-screw type fastening, mill flat round damper pin to avoid slippage.

2.10 ENCLOSURES

- A. BAS Control equipment shall be provided and installed where shown on the associated HVAC Drawings and where needed for complete installation of BAS components. Coordinate mounting locations with other trades.
- B. Controllers, power supplies and relays shall be mounted in enclosures. These items may also be mounted within the HVAC equipment control section if permitted by the HVAC equipment manufacturer, and if adequate space is provided.
- C. Control Enclosures: Hinged doors, key lock latch; single key

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Carefully inspect installed work of other trades. Verify work is complete to where work of this Section may commence.
- B. Do not proceed with installation until substrates have been prepared using methods recommended by manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- C. If preparation is the responsibility of another installer, notify Architect and Owner's representative in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
 - 1. Install in conduit, wiring and cable, and install equipment in first-class manner, using proper tools, equipment, hangers, and supports, and in locations as required for a neat, attractive installations. No material shall be exposed if it is possible to conceal it. Exposed material shall be installed only with consent of the Engineer.
 - 2. Install the system as recommended by the manufacturer, using only equipment recommended or acceptable to the manufacturer.
 - 3. Support sensors as recommended by the manufacturer where inside equipment, such as ductwork. Sensors in the space shall be in small, attractive housings designed for that purpose and mounted on electrical junction box.
 - 4. Control tubing shall be supported at frequent intervals to support sagging. Tubing run in exposed areas shall be run in an inconspicuous manner following natural building lines. In finished portions of the building, tubing shall be run concealed.
 - 5. Use extreme care making connections to other equipment. Safeties of equipment are not to be by-passed or overridden by the BAS.
 - 6. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
 - 7. Install labels to identify control components.
 - 8. Provide equipment having moving parts and controlled by BAS with warning labels 2 inches (51 mm) in height, and in bright warning colors, stating equipment is remotely started by automatic controls. Post labels clearly in area of moving parts, including but not limited to belts, fans and pumps.
 - 9. VAV and Terminal Unit Controllers:
 - a. Terminal unit controllers and actuators shall be factory mounted.
 - 1) Ship controller the terminal unit manufacturer for factory mounting.
 - 2) The Terminal Unit Manufacturer Shall:
 - a) Mount the combination controller, actuator and differential pressure sensor package on the terminal units.

- b) Connect pressure sensing tubes to differential pressure sensor.
- b. At the HVAC contractors option, the VAV terminal units maybe field mounted on the terminal units, in lieu of factory mounting. The HVAC contractor shall coordinate this work with the BAS Contractor and the Equipment Manufacturer.

3.3 LOCATION AND INSTALLATION OF COMPONENTS

- A. Locate and install components for easy accessibility; in general, mount 48 inches (1219 mm) above floor with minimum 36 inches (914 mm) of clear access space in front of units. Obtain approval on locations from Owner's representative prior to installation.
- B. Components including but not limited to instruments, switches, and transmitters; suitably wired and mounted to protect them from vibration, moisture, and high or low temperatures.
- C. Identify equipment and panels. Provide permanently mounted tags for panels.
- D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections, and sized to suit pipe diameter without restricting flow.

3.4 INTERLOCKING AND CONTROL WIRING

- A. Interlock and control wiring. Install wiring neatly and professionally, per Division 26 and national, state and local electrical codes.
- B. Wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Shielded low capacitance wire for communications trunks.
- C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of control equipment with the Owner's representative prior to rough-in.
- D. Provide auxiliary pilot duty relays on motor starters as required for control function.
- E. Provide power for control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.
- F. Install control wiring in mechanical, electrical, telephone and boiler rooms in raceways. Install other wiring neatly and inconspicuously per local code. If code allows, control wiring above accessible ceiling spaces may be run with plenum-rated cable (without conduit).

3.5 SOFTWARE

- A. Load and debug software for BAS. Operate to prove functionality of each system.
 - 1. Provide database generation.
 - 2. System displays: Show analog and binary object types within system; logically laid out for easy use by Owner. Provide outside air temperature indication on system displays associated with economizer cycles.
 - 3. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan. Warning limits for each point shall be entered for alarm and or maintenance purposes.
 - 4. Binary and analog object types (including zones) shall have the capability to be automatically trended.
 - 5. Analog inputs (High/Low Limits) and selected binary input alarm points to be prioritized and routed (locally or remotely) with alarm message per Owner's requirements.
- B. BAS Contractor: Review programs with Engineer in the programming stage. Make sure programmer understands Engineer's intent and that program will carry out that intent.
- C. Bound copy of the complete information on the equipment and components.

- D. Spare parts list. Identify equipment critical to maintaining integrity of operating system.

3.6 SYSTEM DEMONSTRATION, VALIDATION AND ACCEPTANCE

- A. Contractor will satisfactorily demonstrate operating sequence, daily and seasonal mode changes, and associated energy management routines for equipment controlled including:
 - 1. Air handling units.
 - 2. Exhaust air systems.
 - 3. VAV terminal units.
 - 4. Miscellaneous Equipment: Including but not limited to the following.
 - a. Ventilation systems.
 - b. Cabinet heaters.
 - c. Unit heaters.
- B. Contractor to satisfactorily demonstrate proper operation of associated system points as defined in Division 23, including but not limited to:
 - 1. Analog input sensing device readings; temperature, humidity, pressure, flow, volume and CO2 sensors.
 - 2. Analog output controls; dampers and speeds; including proper ranging.
 - 3. Binary input status readings.
 - 4. Binary output or two position controls; start/stops, open/closed, in/off.
 - 5. Pulsed inputs; flow meters, electric meters; including proper ranging.
- C. Upon Completion of Work:
 - 1. Demonstrate complete operating system to Owner's representative.
 - 2. Certificate stating control system has been tested and adjusted for proper operation.

3.7 TRAINING

- A. By BAS manufacturer. Utilize manuals, as-built documentation and on-line help utility.
- B. Operator Training: Eight (8) hours (on-site or virtual) encompassing, but not limited to the following topics.
 - 1. Sequence of operation review.
 - 2. Log in, log out.
 - 3. Password assignment and modification.
 - 4. Operator privileges assignment and modification.
 - 5. Selection of displays and reports.
 - 6. Commanding of points, including disable/enable.
 - 7. Use of dialog boxes and menus.
 - 8. Modifying warning limits, alarm limits and start-stop times.
 - 9. Modification of color graphic displays.
 - 10. Modification of alarm and status descriptors.
 - 11. System initialization.
 - 12. Backup, download and initialization of DDC in controllers.
 - 13. Request and viewing of trend logs.
 - 14. Archive and purge of historical data.
 - 15. System maintenance procedures.

3.8 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.9 CLEANING AND PROTECTION

- A. Clean and protect products in accordance with the manufacturer's recommendations.

- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

GENERAL NOTES			
----- GENERAL NOTES -----			
1. ENTIRE INSTALLATION SHALL CONFORM TO THE REQUIREMENTS OF THE 2019 CALIFORNIA MECHANICAL CODE, 2019 CALIFORNIA BUILDING CODE, AND ALL OTHER APPLICABLE CODES AND REGULATIONS, INCLUDING 2019 BUILDING ENERGY EFFICIENCY STANDARDS DIVISION T-24.	2. 2019 CALIFORNIA GREEN BUILDING STANDARDS (CALGREEN) CODE INCLUDING THE APPLICABLE MANDATORY MEASURES:	3. 5.201.1 CALIFORNIA ENERGY CODE, FOR THE PURPOSES OF MANDATORY ENERGY EFFICIENCY STANDARDS IN THIS CODE, THE CALIFORNIA ENERGY COMMISSION WILL CONTINUE TO ADOPT MANDATORY STANDARDS.	4. 5.504.3 COVERING OF DUCT OPENINGS AND PROTECTION OF MECHANICAL EQUIPMENT DURING CONSTRUCTION, AT THE TIME OF ROUGH INSTALLATION AND DURING STORAGE ON THE CONSTRUCTION SITE UNTIL FINAL STARTUP OF THE HEATING, COOLING AND VENTILATING EQUIPMENT, ALL DUCT AND OTHER RELATED AIR DISTRIBUTION COMPONENT OPENINGS SHALL BE COVERED WITH TAPE, PLASTIC, SHEET METAL OR OTHER METHODS ACCEPTABLE TO THE ENFORCING AGENCY TO REDUCE THE AMOUNT OF DUST, WATER AND DEBRIS WHICH MAY ENTER THE SYSTEM.
5. 5.504.5.3.1 FILTERS, IN MECHANICALLY VENTILATED BUILDINGS, PROVIDE REGULARLY OCCUPIED AREAS OF THE BUILDING WITH AIR FILTRATION MEDIA FOR OUTSIDE AND RETURN AIR PRIOR TO OCCUPANCY THAT PROVIDES AT LEAST A MINIMUM EFFICIENCY REPORTING VALUE (MERV) OF 8. MERV 8 FILTERS SHALL BE INSTALLED PRIOR TO OCCUPANCY AND RECOMMENDATIONS FOR MAINTENANCE WITH FILTERS OF THE SAME VALUE SHALL BE INCLUDED IN THE OPERATION AND MAINTENANCE MANUAL. EXCEPTIONS:	-a. AN ASHRAE 10-PERCENT TO 30-PERCENT EFFICIENCY FILTER SHALL BE PERMITTED FOR AN HVAC UNIT MEETING THE 2019 CALIFORNIA ENERGY CODE HAVING 60,000 BTU/H OR LESS CAPACITY PER FAN COIL, IF THE ENERGY USE OF THE AIR DELIVERY SYSTEM IS 0.4 WCFM OR LESS AT THE DESIGN AIR FLOW.	-b. EXISTING MECHANICAL EQUIPMENT.	5. 5.506.1 OUTSIDE AIR DELIVERY, FOR MECHANICALLY OR NATURALLY VENTILATED SPACES IN BUILDINGS, MEET THE MINIMUM REQUIREMENTS OF SECTION 121 REQUIREMENTS FOR VENTILATION OF THE 2019 CALIFORNIA ENERGY CODE, OR THE APPLICABLE LOCAL CODE, WHICHEVER IS MORE STRINGENT, AND DIVISION 1, CHAPTER 4 OF CCR, TITLE 8.
5. 5.508.1 OZONE DEPLETION AND GREENHOUSE GAS REDUCTIONS. INSTALL HVAC AND FIRE SUPPRESSION EQUIPMENT SHALL COMPLY WITH 5.508.1.1 AND 5.508.1.2.	5. 5.508.1.1 CHLOROFLUOROCARBONS (CFCs). INSTALL HVAC, REFRIGERATION AND FIRE SUPPRESSION EQUIPMENT THAT DO NOT CONTAIN CFCs.	5. 5.508.1.2 HALONS. INSTALL HVAC, REFRIGERATION AND FIRE SUPPRESSION EQUIPMENT THAT DO NOT CONTAIN HALONS.	- ADHESIVES, SEALANTS AND CAULKS SHALL MEET CALGREEN REQUIREMENTS.
- INSTALLER AND SPECIAL INSPECTORS SHALL MEET ALL QUALIFICATIONS LISTED IN SECTION 702 OF THE 2019 CALIFORNIA GREEN BUILDING STANDARDS CODE.	3. COORDINATE ENTIRE INSTALLATION OF THE HVAC SYSTEM WITH THE WORK OF ALL OTHER TRADES PRIOR TO ANY FABRICATION OR INSTALLATION. PROVIDE ALL FITTINGS, OFFSETS, AND TRANSITIONS AS REQUIRED FOR A COMPLETE WORKABLE INSTALLATION. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE ITEMS TO BE PROVIDED BY OTHER TRADES WHERE MENTIONED IN THE CONTRACT DOCUMENTS PRIOR TO BID - NO EXCEPTIONS.	4. COORDINATE THE LOCATIONS OF ALL CEILING DIFFUSERS, REGISTERS, AND GRILLES WITH THE ARCHITECTURAL REFLECTIVE CEILING PLAN, ELECTRICAL LIGHTING LAYOUT AND ARCHITECTURAL ROOM ELEVATIONS. THE ARCHITECT AND ENGINEER SHALL BE IMMEDIATELY NOTIFIED OF ANY CONFLICTS PRIOR TO FABRICATION AND INSTALLATION.	5. CONTRACTOR SHALL NOTIFY OWNER AND ENGINEER OF CONSTRUCTION PHASING PRIOR TO START OF CONSTRUCTION, REMOVAL, AND/OR REPLACEMENT OF ANY EQUIPMENT. CONTRACTOR SHALL RECEIVE PERMISSION IN WRITING PRIOR TO THE START OF ANY WORK DURING ANY PHASE FOR WORK SHOWN HEREIN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT WORK AND ARRANGE HIS WORK IN A MANNER THAT WILL CAUSE MINIMAL INTERFERENCE WITH DAILY FUNCTIONS WITHIN THE FACILITY, ANY EXPECTED DOWNTIME SHALL BE COORDINATED WITH THE OWNER.
6. ALL EQUIPMENT, DUCTS, PIPING, AND OTHER DEVICES AND MATERIALS INSTALLED OUTSIDE OF THE BUILDING OR OTHERWISE EXPOSED TO THE WEATHER SHALL BE COMPLETELY WEATHER-PROOFED AND PAINTED TO MATCH, COORDINATE WITH ARCHITECT PRIOR TO PAINTING.	7. THE OWNER ACKNOWLEDGES THAT THE DESIGN PROFESSIONAL'S PLANS ARE INSTRUMENTS OF PROFESSIONAL SERVICE. NEVERTHELESS, THE PLANS PREPARED UNDER THIS AGREEMENT SHALL BECOME THE PROPERTY OF THE OWNER UPON COMPLETION OF THE WORK. THE OWNER AGREES TO HOLD HARMLESS AND INDEMNIFY THE DESIGN PROFESSIONAL AGAINST ALL DAMAGES, CLAIMS AND LOSSES, INCLUDING DEFENSE COSTS, ARISING OUT OF ANY RESCUE OF THE PLANS WITHOUT THE WRITTEN AUTHORIZATION OF THE DESIGN PROFESSIONAL.	8. ALL DIMENSIONS SHOWN ON THESE PLANS ARE APPROXIMATE AND MUST BE CONFIRMED ON SITE.	9. PRIOR TO OCCUPANCY, THE ENTIRE H.V.A.C. SYSTEMS SHALL BE BALANCED IN ACCORDANCE WITH (ABC) ASSOCIATED AIR BALANCE COUNCIL STANDARDS BY AN INDEPENDENT AIR BALANCE CONTRACTOR. CERTIFICATION SHALL BE PROVIDED BY THE CONTRACTOR FOR AIR AND HYDRONIC AS APPLICABLE. SYSTEMS SHALL BE BALANCED AS INDICATED ON PLANS INCLUDING FRESH AIR VENTILATION, WHERE THERE IS A CONFLICT WITH THE MECHANICAL PLANS, THE AIR BALANCE CONTRACTOR SHALL NOTIFY THE ENGINEER PRIOR TO BALANCING OF SYSTEM. IF NOT THE AIR BALANCE CONTRACTOR SHALL BEAR ALL COSTS INCURRED FOR WORK THAT MUST BE RE-BALANCED DUE TO CONFLICTS ON CONTRACT DOCUMENTS. CONTRACTOR SHALL PROVIDE THREE COPIES OF THE AIR BALANCE REPORT TO THE ENGINEER FOR APPROVAL.
10. FOR INACCESSIBLE AREAS THE CONTRACTOR SHALL PROVIDE ACCESS PANELS FOR ALL DAMPERS, EQUIPMENT, SMOKE DETECTORS, AND CONTROL DEVICES. THESE PANELS SHALL MATCH THE RATING OF THE WALL AND/OR CEILING THAT THEY ARE LOCATED IN. MINIMUM ACCESS PANEL SIZES SHALL BE AS FOLLOWS:	1) HAND ACCESS: 12"x12"	2) BODY ACCESS: 30"x30" MIN. WHERE A LARGER ACCESS SIZE IS REQUIRED DUE TO INSTALLATION CONSTRAINTS, THE CONTRACTOR SHALL DO SO AT NO ADDITIONAL COST AND SHALL NOTIFY THE ARCHITECT AND ENGINEER OF DEVIATIONS PRIOR TO INSTALLATION.	11. COORDINATE THE LOCATION OF ALL ROOF OPENINGS AND THE LOCATION OF ALL ROOF MOUNTED EQUIPMENT WITH THE STRUCTURAL AND ARCHITECTURAL PLANS PRIOR TO ANY INSTALLATION.
12. PLATFORMS, CURBS, AND FLASHINGS FOR MECHANICAL EQUIPMENT SHALL BE AS INDICATED ON THE STRUCTURAL AND ARCHITECTURAL PLANS, UNLESS NOTED OTHERWISE. WHERE THERE IS A CONFLICT WITH THE MECHANICAL PLANS, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT AND ENGINEER PRIOR TO FABRICATION AND INSTALLATION.	13. ALL EQUIPMENT, ACCESSORIES, AND RELATED PIPING SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE EQUIPMENT MANUFACTURER'S RECOMMENDATIONS. PROVIDE ALL FITTINGS, TRANSITIONS, DAMPERS, VALVES, AND OTHER DEVICES AS REQUIRED FOR A COMPLETE WORKABLE INSTALLATION.	14. MAINTENANCE LABEL SHALL BE AFFIXED TO ALL MECHANICAL EQUIPMENT AND A MAINTENANCE MANUAL SHALL BE PROVIDED FOR THE OWNER'S USE.	15. PROVIDE MERV 13 EFFICIENCY THROWAWAY FILTERS FOR ALL AIR CONDITIONING UNITS. SEE EQUIPMENT SCHEDULE AND SPECIFICATIONS FOR TYPE. SIZES SHALL BE AS RECOMMENDED BY THE MANUFACTURER, UNLESS OTHERWISE SPECIFIED.
16. AIR FILTERS SHALL BE STATE FIRE MARSHAL APPROVED AND LISTED. PRE-FORMED FILTERS HAVING COMBUSTIBLE FRAMING SHALL BE TESTED AS A COMPLETE ASSEMBLY. AIR FILTERS SHALL BE ACCESSIBLE FOR CLEANING OR REPLACEMENT.	17. ALL EQUIPMENT WITH MOVING PARTS SHALL BE PROVIDED WITH FLEXIBLE DUCT AND PIPE CONNECTIONS.	18. ALL EQUIPMENT SHALL BE LABELED AS TO THE SPACE IT SERVES.	19. ALL HVAC EQUIPMENT SHALL BE CERTIFIED BY THE CALIFORNIA ENERGY COMMISSION TO COMPLY WITH LATEST EFFICIENCY STANDARDS.
20. PROVIDE MANUAL VOLUME DAMPERS AND BACKDRAFT DAMPERS FOR FRESH AIR INTAKES ON ALL AIR HANDLING EQUIPMENT AND EXHAUST FANS SERVING CONDITIONED SPACES. EXCEPTION: EQUIPMENT WITH FACTORY ECONOMIZERS. DAMPERS SITUATED ON THE ROOF SHALL BE SECURED AFTER BALANCING, TO AVOID THE POSSIBILITY OF ADJUSTMENT.	21. ALL AIR HANDLING EQUIPMENT SERVING CONDITIONED SPACES SHALL PROVIDE CONTINUOUS FRESH AIR TO SPACES IN OCCUPIED MODE.	22. CONTRACTOR SHALL VERIFY ALL CLEARANCES AND AVAILABLE SPACE FOR DUCTWORK PRIOR TO ORDERING AND/OR FABRICATING MATERIAL.	23. CONTRACTOR TO SUBMIT ALL EQUIPMENT, DUCTWORK, AIR DISTRIBUTION DEVICES, AND OTHER ACCESSORIES TO THE ENGINEER FOR APPROVAL PRIOR TO ANY ORDERING OF SUCH ITEMS.
24. CONTRACTOR SHALL BE RESPONSIBLE FOR COMMISSIONING OF EQUIPMENT.	25. PAINT EXPOSED SURFACES, WHETHER OR NOT COLORS ARE DESIGNATED IN SCHEDULES, EXCEPT WHERE A SURFACE OR MATERIAL IS SPECIFICALLY INDICATED NOT TO BE PAINTED OR IS TO REMAIN NATURAL. WHERE AN ITEM OR SURFACE IS NOT SPECIFICALLY MENTIONED, PAINT THE SAME AS SIMILAR ADJACENT MATERIALS OR SURFACES. IF COLOR OR FINISH IS NOT DESIGNATED, THE OWNER'S REPRESENTATIVE WILL SELECT FROM STANDARD COLORS OR FINISHES AVAILABLE.	1) PAINTING INCLUDES FIELD PAINTING EXPOSED BARE AND COVERED PIPES AND DUCTS (INCLUDING COLOR CODING), HANGERS, EXPOSED STEEL AND IRON WORK, AND PRIMED METAL SURFACES OF MECHANICAL AND ELECTRICAL EQUIPMENT.	26. ALL MECHANICAL PIPING SYSTEMS, DUCTS, CONTROLS, VALVES, APPARATUS, ETC., EXCEPT THOSE THAT ARE INSTALLED IN INACCESSIBLE LOCATIONS IN PARTITIONS, WALLS, AND FLOORS, AND THOSE BURIED UNDERGROUND, SHALL BE PERMANENTLY MARKED AND IDENTIFIED AS INDICATED IN THE RELATED SPECIFICATIONS.
27. UNLESS SPECIFICALLY SHOWN ON THESE PLANS NO STRUCTURAL MEMBER SHALL BE CUT, DRILLED NOR NOTCHED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE STRUCTURAL ENGINEER AND THE DISTRICT STRUCTURAL ENGINEER FROM THE DIVISION OF THE STATE ARCHITECT.	28. CONTRACTOR TO BALANCE THE AIRFLOW FOR THE HVAC UNITS AND ALSO CHECK PROPER OPERATION OF THE ECONOMIZER/ POWER EXHAUST TO MAINTAIN 0.2 INCHES MAXIMUM DIFFERENTIAL PRESSURE AT EACH DOOR TO MEET THE ADA REQUIREMENTS FOR DOOR OPENING CLOSURE OF NO MORE THAN 5 POUNDS. CONTRACTOR TO MAKE NECESSARY ADJUSTMENTS TO MEET THESE REQUIREMENTS	29. CONTRACTOR SHALL PROVIDE EXTERIOR MANUAL VOLUME DAMPER HANDLES W/ LOCK-DOWN AFTER COMPLETING AIR BALANCE & OBTAIN FINAL APPROVAL FROM ENGINEER	30. ALL FLEXIBLE DUCTWORK SHALL NOT EXCEED FIVE FEET IN LENGTH TO RESPECTIVE DIFFUSERS, GRILLES, AND REGISTERS, OR OTHER AIR DEVICES
31. PROVIDE SEISMIC RESTRAINTS TO ALL DUCTWORK, PIPE, AND EQUIPMENT SUPPORTS IN ACCORDANCE WITH THE LATEST SMACNA GUIDELINES FOR SEISMIC RESTRAINT OF MECHANICAL SYSTEMS. SUSPENDED EQUIPMENT SHALL BE PROVIDED WITH SEISMIC ANCHORAGE AND ISOLATION SUPPORTS.	32. ALL DUCT TURNS IN SUPPLY, RETURN, AND EXHAUST DUCTS SHALL HAVE SINGLE WALL TURNING VANES WITH TRAILING EDGES, UNLESS OTHERWISE NOTED.	33. DUCTWORK HANDLING CONDITIONED AIR SHALL BE INSULATED OR LINED AS INDICATED ON DRAWINGS. SUPPLY AND RETURN DUCT INSULATION SHALL BE MIN. 2" THICK, 1.5 LB./CUBIC FT. DENSITY AND HAVE A MIN. VALUE OF R-8 WHERE LOCATED IN ONE OR MORE OF THE FOLLOWING SPACES:	34. A) OUTDOORS, OR
35. B) IN A SPACE BETWEEN THE ROOF AND AN INSULATED CEILING, OR	36. C) IN A SPACE DIRECTLY UNDER A ROOF WITH FIXED VENTS OR OPENINGS TO THE OUTSIDE OR UNCONDITIONED SPACES, OR	37. D) IN AN UNCONDITIONED CRAWLSPACE; OR	38. E) IN OTHER UNCONDITIONED SPACES
39. PER 2019 CEC, OTHERWISE PROVIDE R-4.2 WHEN LOCATED IN CONDITIONED ATTIC SPACES ABOVE CEILINGS. ALL DUCTWORK EXPOSED ON ROOF SHALL BE INTERNALLY LINED WITH 2" THICK, 1.5 LB./CUBIC FT. DENSITY DUCT LINER UNLESS OTHERWISE INDICATED OR SPECIFIED. ALL DUCT SIZES ARE NET CLEAR INSIDE DIMENSIONS. ALL DUCT JOINTS SHALL BE SEALED PER CHAPTER 6 MECHANICAL CODE REQUIREMENTS. PROVIDE PIPING AND DUCT INSULATION IN ACCORDANCE WITH THE LATEST STANDARDS OF THE CALIFORNIA ENERGY COMMISSION.	40. ALL INSULATION SHALL HAVE A FLAME SPREAD OF NOT MORE THAN 25 AND A SMOKE DENSITY NOT EXCEEDING 50.	41. MANUAL VOLUME DAMPERS SHALL BE PROVIDED IN ALL DUCT BRANCHES TO INDIVIDUAL DIFFUSERS, GRILLES, AND REGISTERS, AS WELL AS FRESH AIR INTAKE DUCTS. DAMPERS SHALL BE LOCATED AT THE BRANCH DUCT LOCATIONS. THE MECHANICAL CONTRACTOR SHALL COORDINATE LOCATIONS OF DAMPERS WITH THE AIR BALANCE CONTRACTOR PRIOR TO BID, SO THEY ARE ACCESSIBLE PRIOR TO INSTALLATION. IN LOCATIONS WHERE THESE DAMPERS ARE INACCESSIBLE, CABLE OPERATED ADJUSTMENT CONTROLS SHALL BE PROVIDED AT NO ADDITIONAL COST. OPPOSED BLADE DAMPERS SHALL NOT BE PERMITTED UNLESS NOTED OTHERWISE.	42. AUTOMATIC SMOKE FIRE DAMPER REQUIREMENTS ARE AS FOLLOWS:
43. A) PROVIDE AUTOMATIC SMOKE FIRE DAMPERS AT ALL PENETRATIONS OF FIRE-RATED CEILINGS AND WALLS THROUGHOUT. CONTRACTOR SHALL COORDINATE FIRE-RATED AREAS WITH THE MECHANICAL DRAWINGS AND OTHER TRADES PRIOR TO INSTALL AND SHALL NOTIFY PERTINENT PARTIES PRIOR TO ANY WORK PERFORMED IN THESE AREAS. IN ADDITION, CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE PROPER ACCESS FOR DAMPERS INSTALLED. THE DAMPER FIRE RATING SHALL BE COMPATIBLE WITH THE CEILING/WALL RATING.	44. B) LOCATION OF FIRE-RATED CEILINGS AND WALLS ARE AS INDICATED ON THE MECHANICAL DRAWINGS.	45. C) FIRE AND/OR SMOKE DAMPER(S) SHALL BE PROVIDED AS REQUIRED BY THE LATEST CALIFORNIA BUILDING CODE.	46. D) CONTRACTOR SHALL FURNISH FLUSH MOUNTED FIRE AND/OR SMOKE DAMPERS, SO THAT DAMPER DO NOT EXTEND PASS WALLS, FOR AREAS WITHOUT CEILINGS FOR QUALITY WORKMANSHIP.
47. CONTRACTOR SHALL PERFORM MAINTENANCE ON ALL EXISTING FIRE AND SMOKE/FIRE DAMPERS PER MANUFACTURER'S PROVISIONS. ANY FAILURES OR NON-OPERATING DAMPERS SHALL BE REPLACED AND SHALL CONFORM TO CURRENT CODE REGULATIONS.	48. ALL DUCTWORK PASSING THROUGH FIRE RATED CORRIDORS AND LOBBIES SHALL BE MIN. 26 GAGE SHEET METAL CONSTRUCTION	49. ALL DUCTWORK, PIPING, CONDUIT, & ETC. PENETRATING FIRE RATED CONSTRUCTION SHALL HAVE APPROVED FIRE STOPPING.	50. UNLESS OTHERWISE NOTED THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING AND INSTALLING EXTERIOR LOUVERS CALLED OUT HEREIN (COORDINATE SIZES) AND LOCATION(S) WITH OTHER TRADES AS NECESSARY PRIOR TO BID.
51. UNLESS SPECIFICALLY SHOWN ON THESE PLANS NO STRUCTURAL MEMBERS SHALL BE CUT, DRILLED, NOR NOTCHED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE STRUCTURAL ENGINEER AND THE DISTRICT STRUCTURAL ENGINEER FROM THE DIVISION OF THE STATE ARCHITECT.	52. CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE THE MINIMUM RATE OF OUTDOOR AIR REQUIRED BY THE STATE ENERGY REGULATIONS.	53. AIR DISTRIBUTION	54. ALL DUCTWORK SHALL BE SHEET METAL CONSTRUCTED OR SPIRAL, ERECTED, AND TESTED IN ACCORDANCE WITH THE MOST RESTRICTIVE OF LOCAL REGULATIONS, PROCEDURES DETAILED IN THE ASHRAE HANDBOOK OF FUNDAMENTALS, CHAPTER 8 OF THE MECHANICAL CODE, OR THE APPLICABLE STANDARDS ADOPTED BY THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION.

LEGEND		
SYMBOL	ABBR.	DESCRIPTION
	-	SUPPLY AIR RISER
	-	RETURN AIR RISER
	-	EXHAUST AIR RISER
	SAG	SUPPLY AIR GRILLE
	RAG	RETURN AIR GRILLE
	EAG	EXHAUST AIR GRILLE
	SWR	SIDEWALL REGISTER
	(L)	LINED DUCTWORK
	FC	FLEXIBLE CONNECTION
	-	NEW DUCT (SEE PLAN)
	-	EXISTING DUCT (SEE PLAN)
	-	DEMO DUCT (SEE PLAN)
	MVD	MANUAL VOLUME DAMPER
	BDD	BACKDRAFT DAMPER
	SFD	SMOKE / FIRE DAMPER
	FD	FIRE DAMPER
	RS	REFRIGERANT SUCTION LINE
	RL	REFRIGERANT LIQUID LINE
	CD	CONDENSATE DRAIN
	G	GAS
	(E)CD	(E)CD EXISTING CONDENSATE DRAIN
	(E)G	(E)G EXISTING GAS
	S.D.	SMOKE DETECTOR
	P.O.C.	POINT OF CONNECTION
	T-STAT	THERMOSTAT
	P.O.R.	POINT OF REMOVAL
	TS	TEMPERATURE SENSOR
	OS	OVERRIDE SWITCH
	PD	PRESSURE DIFFERENTIAL SWITCH
	S	SWITCH
	O.C.	ON CENTER
	I.D.	INSIDE DIAMETER
	O.D.	OUTSIDE DIAMETER
	W/	WITH
	S/M	SHEET METAL
	S/S	STAINLESS STEEL
	G.C.	GENERAL CONTRACTOR
	VTR	VENT THRU ROOF
	EMS	ENERGY MANAGEMENT SYSTEM
	OBD	OPPOSED BLADE DAMPER
	FSC	FAN SPEED CONTROL
	(E)	EXISTING
	E	ITEMS FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR AS SPECIFIED ON THE ELECTRICAL CONTRACT DOCUMENTS
	M	ITEMS FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR AS SPECIFIED ON THE MECHANICAL CONTRACT DOCUMENTS
	EM	ITEMS FURNISHED BY ELECTRICAL CONTRACTOR AND INSTALLED BY MECHANICAL CONTRACTOR.
	ME	ITEMS FURNISHED BY MECHANICAL CONTRACTOR AND INSTALLED BY ELECTRICAL CONTRACTOR.
	C.C.	CONTROLS CONTRACTOR
	CBD	COUNTER-BALANCE DAMPER
	D.S.	DOOR SWITCH

SHEET INDEX		
S.NO.	SHEET No.	SHEET TITLE
1	M-0.1	MECHANICAL GENERAL NOTES AND LEGEND
2	M-0.2	MECHANICAL SCHEDULES SIM BLDG
3	MD-1.1	SIMS BLDG DEMO ROOF PLAN
4	M-1.1	REMODELED SIMS BLDG ROOF PLAN
5	M-1.2	FIRST FLOOR PLAN REMODEL
6	M-1.3	SECOND FLOOR PLAN REMODEL
7	M-2.1	MECHANICAL DETAILS
8	M-2.2	MECHANICAL DETAILS
9	M-2.3	MECHANICAL DETAILS
10	M-2.4	MECHANICAL DETAILS
11	M-3.1	ALERTON CONTROLS RISER DIAGRAM
12	M-3.2	ZONE DAMPER BOX DETAILS
13	M-4.1	TITLE 24 REPORT
14	M-4.2	TITLE 24 REPORT

MEP COMPONENT ANCHORAGE NOTE	
ALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED PER THE DETAILS ON THE DSA-APPROVED CONSTRUCTION DOCUMENTS, WHERE NO DETAIL IS INDICATED. THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCE AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2019 CBC, SECTIONS 1616A.1.18 THROUGH 1616A.1.26 AND ASCE 7-16 CHAPTERS 13, 26 AND 30:	
1. ALL PERMANENT EQUIPMENT AND COMPONENTS.	2. TEMPORARY OR MOVABLE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER.
3. MOVABLE EQUIPMENT THAT IS STATIONED IN ONE PLACE FOR MORE THAN 8 HOURS AND HEAVIER THAN 400 POUNDS IS REQUIRED TO BE ANCHORED WITH TEMPORARY ATTACHMENTS.	
THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE, BUT THE ATTACHMENT NEED NOT BE DETAILED ON THE PLANS. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT.	
A. COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVING A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT.	B. COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.
FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAILS ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE DESIGN PROFESSIONAL. IN GENERAL, RESPONSIBLE CHARGE OR STRUCTURAL ENGINEER DELEGATED RESPONSIBILITY AND THE DSA DISTRICT STRUCTURAL ENGINEER. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH ABOVE REQUIREMENTS.	

SEISMIC NOTES	
PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEM BRACING NOTE	
PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-16 SECTION 13.3 AS DEFINED IN ASCE 7-16 SECTION 13.6.1, 13.6.2, 13.6.3, 13.6.4, 13.6.5, AND 2019 CBC, SECTIONS 1616A.1.23, 1616A.1.24, 1616A.1.25 AND 1616A.1.26.	
THE METHOD OF SHOWING BRACING AND ATTACHMENTS TO THE STRUCTURE FOR THE IDENTIFIED DISTRIBUTION SYSTEM ARE AS NOTED BELOW. WHEN BRACING AND ATTACHMENTS ARE BASED ON A PRE-APPROVED INSTALLATION GUIDE (E.G. SMACNA OR OSHPD OPM), COPIES OF THE BRACING SYSTEM INSTALLATION GUIDE OR MANUAL SHALL BE AVAILABLE ON THE JOBSITE PRIOR TO THE START OF AND DURING THE HANGING AND BRACING OF THE DISTRIBUTION SYSTEMS. THE STRUCTURAL ENGINEER OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGER AND BRACE LOADS.	
MECHANICAL PIPING (MP), MECHANICAL DUCTS (MD), PLUMBING PIPING (PP), ELECTRICAL DISTRIBUTION SYSTEMS (E):	
MP MD PP E	- OPTION 1: DETAILED ON THE APPROVED DRAWINGS WITH PROJECT SPECIFIC NOTES AND DETAILS.
MP MD PP E	- OPTION 2: SHALL COMPLY WITH THE APPLICABLE OSHPD PRE-APPROVAL (OPM #) #0043-13.

SHOP DRAWINGS NOTES	
CONTRACTOR SHALL SUBMIT A COMPLETE SET OF SHOP DRAWINGS 14 DAYS AFTER OFFICIAL PROJECT START DATE, INCLUSIVE OF ALL TRADE (MECHANICAL, PLUMBING, ELECTRICAL, ETC.) TO SCALE (MIN. 1/4"=1'-0") PRIOR TO FABRICATION AND OR INSTALLATION OF ANY AND ALL HVAC COMPONENTS, SYSTEM AND EQUIPMENT. SHOP DRAWINGS SHALL BE SUBMITTED AS A SINGLE ALL INCLUSIVE PACKAGE DIGITALLY (AUTOCAD) AND A MINIMUM 4 HARD COPY SETS ARE TO BE SUBMITTED TO THE ENGINEER FOR REVIEW. INCOMPLETE AND UNCOORDINATED SUBMITTALS SHALL BE REJECTED UPON RECEIPT.	

APPLICABLE CODES	
2019 BUILDING STANDARDS ADMINISTRATIVE CODE, PART 1 TITLE 24 C.C.R. 2019 CALIFORNIA BUILDING CODE (CBC), PART 2, TITLE 24 C.C.R. 2019 CALIFORNIA ELECTRICAL CODE (CEC), PART 3, TITLE 24 C.C.R. (2017 NEC) 2019 CALIFORNIA MECHANICAL CODE (CMC), PART 4, TITLE 24 C.C.R. 2019 CALIFORNIA PLUMBING CODE (CPC), PART 5, TITLE 24 C.C.R. 2019 CALIFORNIA ENERGY CODE, PART 6, TITLE 24 C.C.R. 2019 CALIFORNIA FIRE CODE, PART 9, TITLE 24 C.C.R. 2019 CALIFORNIA REFERENCED STANDARDS, PART 12, TITLE 24 C.C.R. TITLE 19 C.C.R., PUBLIC SAFETY, STATE FIRE MARSHAL REGULATIONS, AMERICAN WITH DISABILITY ACT	
PARTIAL LIST OF APPLICABLE STANDARDS:	
NFPA 13	AUTOMATIC SPRINKLER SYSTEM.
NFPA 24	2016 EDITION.
NFPA 24	PRIVATE FIRE MAINS (INCLUDED IN 2016 NFPA 13)
NFPA 72	2016 EDITION.
NFPA 72	NATIONAL FIRE ALARM CODE (CALIFORNIA AMENDED)
NFPA 72	2016 EDITION.
NFPA 72	(NOTE: SEE UL STANDARD 1971 FOR "VISUAL DEVICES")
REFERENCE CODE SECTION FOR NFPA STANDARDS - 2019 CBC (SFM) CHPT. 35	

AGENCY APPROVAL



STAMP



PROJECT NAME:

NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING
600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

No.	Rev. Date	Description
1	03-09-21	BIDDING ADD #1
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SHEET DESCRIPTION:
MECHANICAL
GENERAL NOTES
& LEGEND

SHEET NO:

M-0.1

NEW/ REPLACEMENT PACKAGED UNIT (AIR COOLED)																																			
SYMBOL	LOCATION	MANUF'R & MODEL NO.	SERVING	CFM	S.P.	RPM	REF.	COOLING					HEATING (FIVE STAGES)			COMP'R		COND FAN			INDOOR FAN			COMB. FAN FLA	EXH. FAN FLA	VOLTAGE	MCA	MFA	MOCP	EER	IEER	WEIGHT (lbs)	DETAIL REF.	DETAIL REF.	REMARKS
								TOTAL MBH	SENSIBLE MBH	EDB	FWB	AMB	INPUT MBH	OUTPUT MBH	EDB	QTY	RLA	QTY	FLA	BHP	HP	FLA													
AC 1	ROOF	CARRIER 48A9S020A	SIMS BLD'G	7500	1.45"	788	R-410A	252	178.5	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	4.80	5	7.6	-	-	460V-3φ	51	-	60	10.1	13.8	4103	B M-2.1	2 M-2.3	1,2,3,4,5,6,7,8,9,10,11	
AC 2	ROOF	CARRIER 48A9S020A	SIMS BLD'G	7500	1.45"	788	R-410A	252	178.5	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	4.80	5	7.6	-	-	460V-3φ	51	-	60	10.1	13.8	4103	B M-2.1	2 M-2.3	1,2,3,4,5,6,7,8,9,10,11	
AC 3	ROOF	CARRIER 48A9S020A	SIMS BLD'G	7500	1.45"	788	R-410A	252	178.5	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	4.80	5	7.6	-	-	460V-3φ	51	-	60	10.1	13.8	4103	B M-2.1	2 M-2.3	1,2,3,4,5,6,7,8,9,10,11	
AC 4	ROOF	CARRIER 48A9S020A	SIMS BLD'G	7500	1.45"	788	R-410A	252	178.5	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	4.80	5	7.6	-	-	460V-3φ	51	-	60	10.1	13.8	4103	B M-2.1	2 M-2.3	1,2,3,4,5,6,7,8,9,10,11	
EQUIPMENT SCHEDULE																																			

- REMARKS
1. Rooftop Unit With GreenSpeed Intelligence

Base Unit

2. Dry-Bulb Changeover Ultra Low Leak Economizer

3. Premium Efficiency 10HP w/VFD Bypass

4. Cu/Cu w/ Variable Comp Controls Expansion Module (CEM) with Phase Monitor

5. Domestic w/BACnet Communication

6. Hinged Service Door

7. 5 Year Warranty on Parts and Compressor

8. Anti Corrosion coating (Luvalta electrofin instlu or equiv.) on both outdoor and indoor coils

9. Provide smoke detector with outdoor

10. M.W. SAUSSE 14" Prefabricated Curb used for alternate installation. See 3/M-2.3 for details.

- NOTES
1. Weights include economizer, curb and all other accessories required.

2. Net Capacities at ARHI conditions

3. Areas with unit supplying more than 2,000 cfm shall be equipped with new smoke detector; the system shall shut down unit(s) in that covered area per 2019 CMC 608. Contractor to remove existing and connect new/replacement smoke detectors to new ac unit.

4. Manufacturer shall size relief cfm to match supply air approximately

5. Reconnect to existing electrical power for ac units and smoke detectors

6. Control Contractor shall coordinate with the Mechanical Contractor, to provide all required accessories (incl. zone, OSA & RA dampers) and wiring to connect to existing EMS. Co-ordinate all requirements with other trades including notifying electrical contractor of necessary conduit and power requirements. All costs for scope of work shall be submitted for final bid.

7. Mech Contractor shall coordinate with the carrier/sigler manufacturer, for all required accessories for a complete and fully functional system, and installation prior to final bid.

OLD/EXISTING PACKAGED UNIT (AIR COOLED) (FOR REFERENCE ONLY)																															
SYMBOL	LOCATION	MANUF'R & MODEL NO.	SERVING	CFM	S.P.	RPM	REF.	COOLING					HEATING (FIVE STAGES)			COMPR					COMB. FAN FLA	EXH. FAN FLA	VOLTAGE	MCA	MFA	MOCP	EER	WEIGHT (lbs)	REMARKS		
								TOTAL MBH	SENSIBLE MBH	EDB	FWB	AMB	INPUT MBH	OUTPUT MBH	EDB	QTY	RLA	QTY	FLA	BHP					HP					FLA	
AC 1	ROOF	CARRIER 48A9S020A	SIMS BLD'G	8000	2"	899	R-410A	255	184	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	6.33	10	14	-	-	460V-3φ	58	-	70	9.8	4176	VAV PACKAGE UNIT W/ LOW LEAK ECONOMIZER
AC 2	ROOF	CARRIER 48A9S020A	SIMS BLD'G	8000	2"	899	R-410A	255	184	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	6.33	10	14	-	-	460V-3φ	58	-	70	9.8	4176	VAV PACKAGE UNIT W/ LOW LEAK ECONOMIZER
AC 3	ROOF	CARRIER 48A9S020A	SIMS BLD'G	8000	2"	899	R-410A	255	184	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	6.33	10	14	-	-	460V-3φ	58	-	70	9.8	4176	VAV PACKAGE UNIT W/ LOW LEAK ECONOMIZER
AC 4	ROOF	CARRIER 48A9S020A	SIMS BLD'G	8000	2"	899	R-410A	255	184	80	67	95	350	283.5	68	3	2"10.6/12.8	2	3.3 EACH	6.33	10	14	-	-	460V-3φ	58	-	70	9.8	4176	VAV PACKAGE UNIT W/ LOW LEAK ECONOMIZER
EQUIPMENT SCHEDULE																															

- NOTE:
- A. CONTRACTOR TO FIELD VERIFY AND RECORD ALL EXISTING UNIT DIMENSIONS FOR RECORD

B. EXISTING ZONE DAMPERS AND DAMPER BOX TO BE REMOVED AND REPLACED (WITH THE SAME SIZE) BY MECHANICAL CONTRACTOR. CONTROL CONTRACTOR TO PROVIDE EQUIPMENT/MATERIALS.

AGENCY APPROVAL



STAMP



PROJECT NAME:

NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING
600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

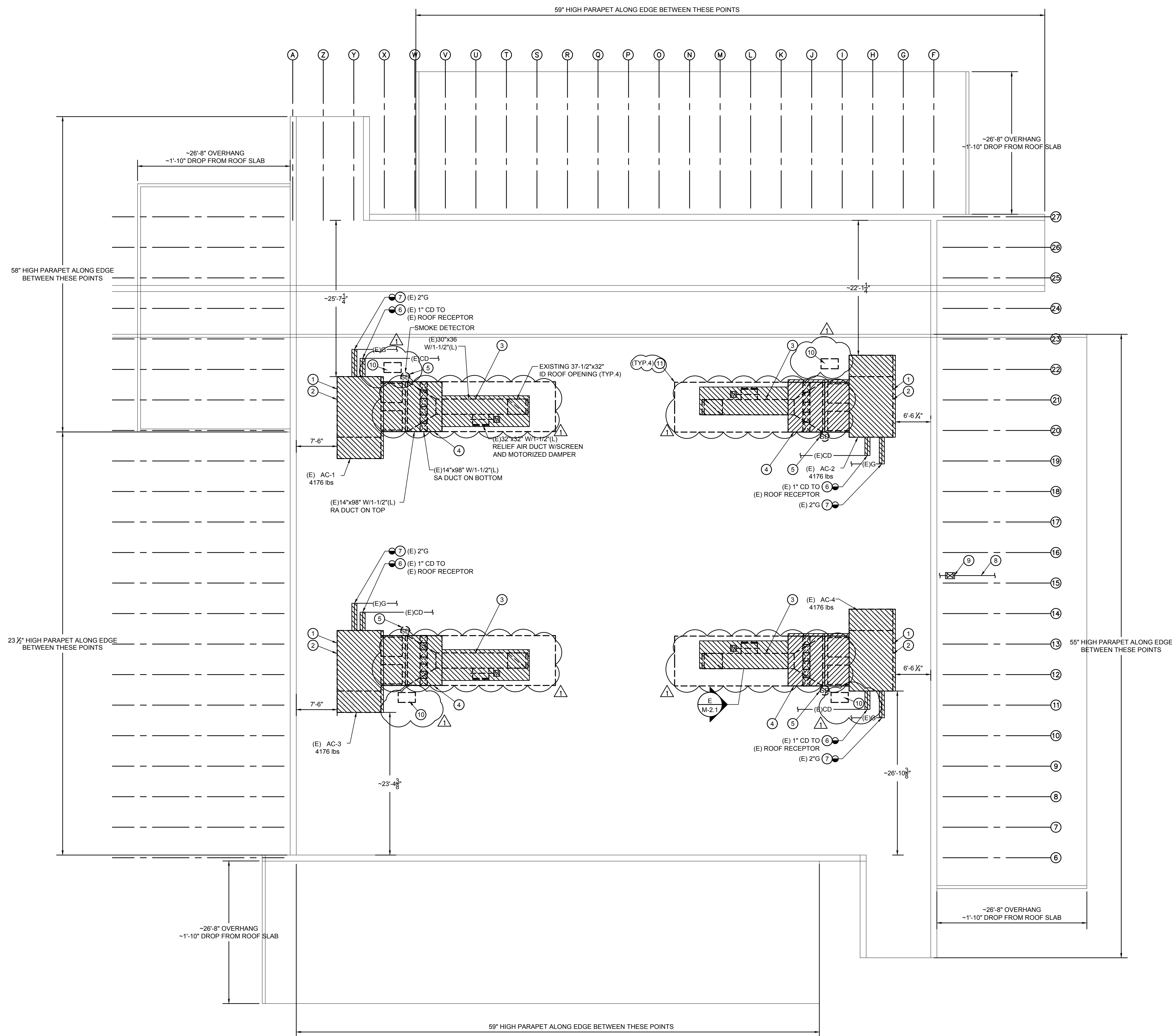
No.	Rev. Date	Description
Δ	03-09-21	BIDDING ADD #1
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JOB NO:	501-20-0007	
DATE:	2020-06-17	
DRAWN:	-- JG	
CHECK:	-- HL	
ARCHITECT:	N/A	
ENGINEER:	OED	
DSA NUMBER:	04-119155	
CONSULTANT		

STAMP

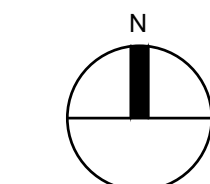
SHEET DESCRIPTION:
MECHANICAL
SCHEDULES
SIM BLDG.

SHEET NO:

M-0.2



SIM BUILDING REMODEL ROOF PLAN



1/8" = 1'-0"

1

DEMOLITION KEY NOTES:

- EXISTING AC UNIT AND ACCESSORIES TO BE REMOVED AND REPLACED WITH NEW AC UNIT. CONTRACTOR TO RECORD ALL EXISTING (E) UNIT & DUCTWORK DIMENSIONS FOR RECORD.
- EXISTING CURB AND FLASHING TO BE REMOVED AND REPLACED NEW TO ACCOMMODATE NEW AC UNITS.
- EXISTING LINED RETURN AIR DUCTS (AND SUPPORTS) TO BE REMOVED AND REPLACED W/ NEW LINED RETURN AIR DUCT OF SAME SIZE (W/ NEW SUPPORTS). MECHANICAL CONTRACTOR TO COORDINATE W/ CONTROL CONTRACTOR TO PROVIDE NEW OUTSIDE AIR DUCT W/ NEW CONTROL DAMPER.
- EXISTING LINED SUPPLY AIR DUCTS AND SUPPORTS TO BE REMOVED AND REPLACED W/ NEW LINED SUPPLY AIR DUCT OF SAME SIZE (W/ NEW SUPPORTS). EXISTING MULTI-ZONE BOX AND DAMPER SIZES TO BE RECORDED AND REMOVED AND REPLACED W/ NEW BY CONTROL CONTRACTOR. INSTALLATION BY MECHANICAL CONTRACTOR.
- EXISTING SMOKE DETECTOR TO BE REMOVED AND REPLACED NEW. (E) SMOKE DETECTOR IS EXPOSED MOUNTED TO DUCTWORK.
- DEMO (E) CD CONNECTION TO MECH UNIT. TEMPORARY CAP (E)CD LINE, PREPARE FOR RECONNECTION.
- DEMO (E) GAS CONNECTION TO MECH UNIT. TEMPORARY CAP (E)GAS LINE, PREPARE FOR RECONNECTION.
- EXISTING 3"GAS PIPING BEL GRADE TO REMAIN.
- EXISTING GAS SOV IN YARD BOX BEL GRADE TO REMAIN.
- EXISTING BOX FOR CONDUITS THRU ROOF. REPLACE WHILE MAINTAINING NO NEW ROOF PENETRATIONS.
- EXISTING PLATFORM TO REMAIN.

DEMOLITION NOTES:

- CONTRACTOR SHALL REUSE EXISTING WALL AND/OR ROOF OPENING(S). MODIFY EXISTING OPENING(S) AS REQUIRED FOR NEW DUCT(S), REGISTER(S), AND ETC. CONTRACTOR SHALL COORDINATE WITH OTHER TRADES AS NECESSARY.
- CONTRACTOR SHALL PATCH AND REPAIR EXISTING WALL AND/OR ROOF OPENING(S) AS NECESSARY FOR EXISTING DUCTS, REGISTERS, & ETC. BEING REMOVED.
- CONTRACTOR SHALL REUSE EXISTING OPENING(S) IN ROOF FOR FUTURE DUCTWORK AND ETC. WHEREVER POSSIBLE COORDINATE WITH OTHER TRADES AS NECESSARY.
- CONTRACTOR SHALL RECORD AND VERIFY EXISTING UNITS' TOTAL AIRFLOWS AND AT EACH ZONE DAMPER BEFORE REMOVING EXISTING UNITS.
- RECONNECT EXISTING GAS LINES TO NEW AC UNITS.
- EXISTING THERMOSTAT TO BE REMOVED AND REPLACED NEW, MOUNT 48" A.F.F. TO TOP OF THERMOSTAT SEE 1/M-2.2 FOR DETAILS.
- CONTRACTOR RECONNECT NEW AC UNITS CONDENSATE LINE TO EXISTING RECEPTACLES FOR EACH.
- NO DEMOLITION SHALL BEGIN UNTIL PLANS INCLUDING THE DEMOLITION WORK HAVE BEEN APPROVED BY DSA

AGENCY APPROVAL



Consulting Engineers
5200 E. La Palma Ave
Anaheim, CA 92807
Telephone (714) 693-2277

STAMP



PROJECT NAME:

NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING

600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

No.	Rev.	Date	Description
1		03-09-21	BIDDING ADD #1
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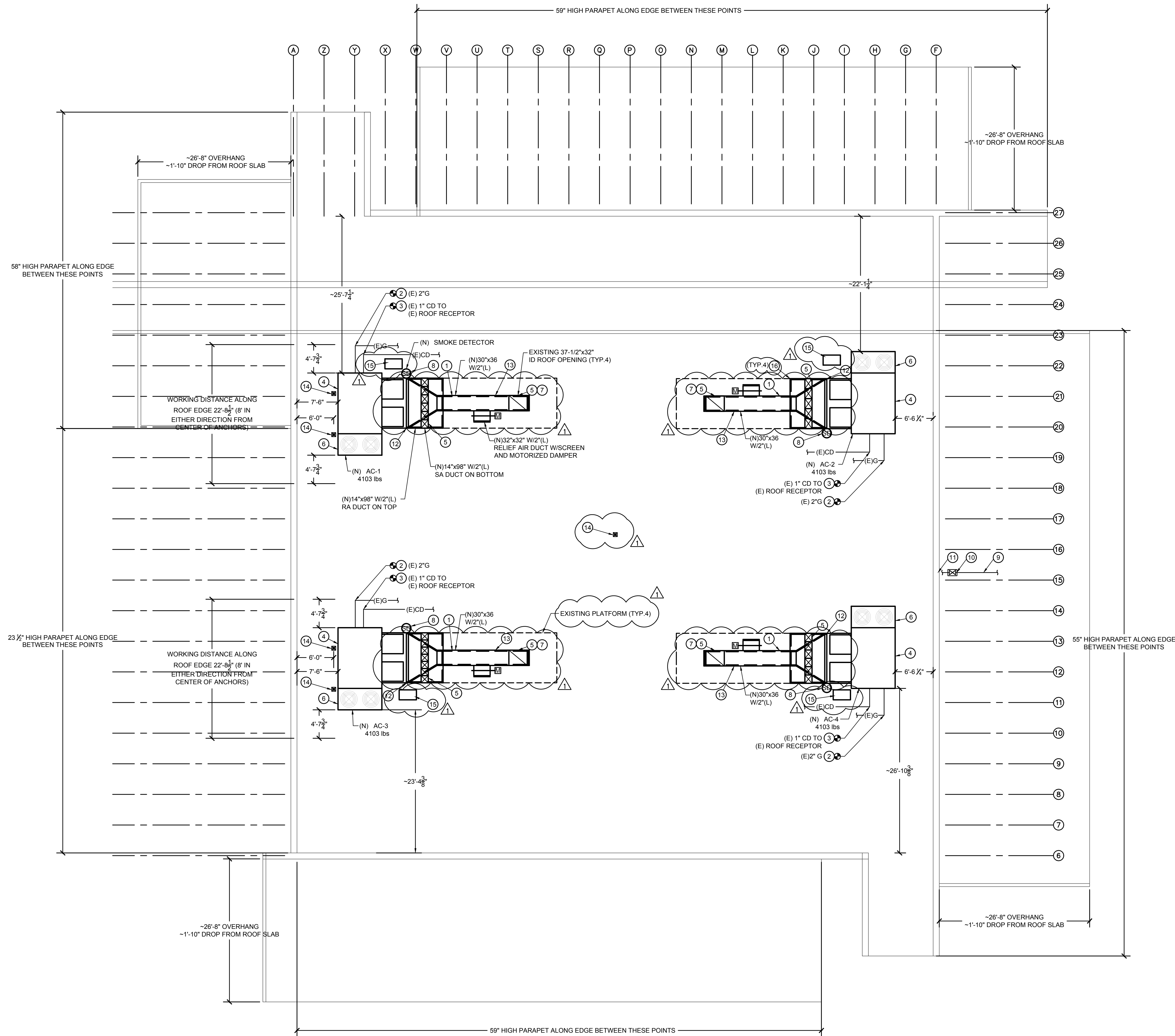
JOB NO.: 501-20-0007
DATE: 2020-06-17
DRAWN: -- JG
CHECK: -- HL
ARCHITECT: N/A
ENGINEER: OED
DSA NUMBER: 04-119155

CONSULTANT

STAMP

SHEET DESCRIPTION:
SIMS BLDG.
DEMO ROOF
PLAN

SHEET NO:
MD-1.1



- CONSTRUCTION KEY NOTES:**
- NEW DUCT SUPPORTS 8' O.C. SEE DETAIL #B/M-2.1
 - CONTRACTOR TO RECONNECT GAS LINE TO EXISTING 2" GAS LINE W/ NEW GAS COCK AND UNION AND 3/4" GAS FLEX CONNECTOR.
 - CONNECT NEW 1" CD TO EXISTING CONDENSATE DRAIN W/ NEW VENTED P-TRAP.
 - EXISTING EQUIPMENT EQUIPMENT ATTACHMENT AND FLASHING MODIFY AS REQUIRED TO FIT NEW UNIT. SEE DETAIL #C/M-2.1 AND #D/M-2.1
 - DUCT CONNECT TO EXISTING DUCT AT ROOF CURB SEE DETAIL #F/M-2.1 FOR DUCT THRU ROOF DETAIL.
 - CONTRACTOR TO CONNECT NEW UNITS TO NEW THERMOSTATS. COORDINATE WITH CONTROL. CONTRACTOR. MOUNT 48" A.F.F. SEE 1/M-2.2 FOR DETAILS
 - EXISTING ROOF OPENING TO BE REUSED.
 - NEW DUCT MOUNTED SMOKE DETECTOR WITH WATERPROOF ENCLOSURE. SEE ELECTRICAL PLANS FOR ELECTRICAL CONNECTIONS.
 - EXISTING 3" GAS PIPING BEL GRADE.
 - EXISTING GAS SOV IN YARD BOX BEL GRADE.
 - PROVIDE "GAS SHUTOFF VALVE" SIGNAGE ON WALL AS REQUIRED.
 - DOUBLE DUCT SUPPORT SEE DETAIL 2/M-2.2
 - SINGLE RETURN DUCT SUPPORT. SEE DETAIL #E/M-2.1
 - PROVIDE TRACEL TBM200S SAFETY TIEBACK ANCHOR BASE PLATE AT POINT SHOWN. SEE 3/M-2.2 FOR DETAILS
 - PROVIDE NEW ROOF PENETRATION ENCLOSURE. RE-USE EXISTING PENETRATIONS. SEE DETAIL 1/M-2.3
 - PROVIDE EDGE FLASHING FOR PLATFORM PER 4/M-2.3

- CONSTRUCTION NOTES:**
- FRESH AIR INTAKES SHALL BE 10'-0" MIN. AWAY FROM ALL EXHAUST OUTLETS, PLUMBING VENTS, AND FLUES.
 - CONTRACTOR SHALL MAINTAIN PROPER CLEARANCES FROM ALL ELECTRICAL EQUIPMENT AND SERVICE CLEARANCES FOR MECHANICAL EQUIPMENT.
 - CONTRACTOR SHALL COORDINATE WORK WITH OTHER TRADES AS NECESSARY PRIOR TO INSTALLATION.
 - FOR INACCESSIBLE AREAS THE CONTRACTOR SHALL PROVIDE ACCESS PANELS FOR ALL DAMPERS, EQUIPMENT, SMOKE DETECTORS, AND CONTROL DEVICES. THESE PANELS SHALL MATCH THE RATING OF THE WALL AND/OR CEILING THAT THEY ARE LOCATED IN. MINIMUM ACCESS PANEL SIZES SHALL BE AS FOLLOWS:
 - 1) HAND ACCESS: 12"x12"
 - 2) BODY ACCESS: 30"x30" MIN.WHERE A LARGER ACCESS SIZE IS REQUIRED DUE TO INSTALLATION CONSTRAINTS, THE CONTRACTOR SHALL DO SO AT NO ADDITIONAL COST AND SHALL NOTIFY THE ARCHITECT AND ENGINEER OF DEVIATIONS PRIOR TO INSTALLATION.
 - CONTRACTOR SHALL FURNISH LINED DUCT WORK AS SHOWN - NO EXCEPTIONS.
 - CONTRACTOR SHALL COORDINATE EXACT EQUIPMENT PAD SIZES AND LOCATIONS WITH OTHER TRADES PRIOR TO INSTALLATION.
 - MECHANICAL CONTRACTOR TO MEASURE AND VERIFY SIZES OF INDIVIDUAL ZONE DAMPERS FOR REMOVAL AND REPLACEMENT. CONTROL CONTRACTOR TO PROVIDE NEW ZONE DAMPERS, MECHANICAL CONTRACTOR TO INSTALL. COORDINATE AS NECESSARY.
 - MECHANICAL CONTRACTOR TO MEASURE AND VERIFY AIRFLOW AT INDIVIDUAL ZONE DAMPERS FOR REMOVAL AND REPLACEMENT. CONTRACTOR TO PRE-BALANCE REPLACEMENT UNITS TO EXISTING CONDITIONS AND AIRFLOWS.

AGENCY APPROVAL

oed optimum energy design

Consulting Engineers
5200 E. La Palma Ave
Anaheim, CA 92807
Telephone: (714) 693-2277



PROJECT NAME:

**NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING**

600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

No.	Rev. Date	Description
1	03-09-21	BIDDING ADD #1
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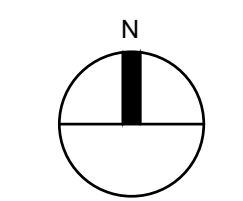
JOB NO: 501-20-0007
DATE: 2020-06-17
DRAWN: JG
CHECK: HL
ARCHITECT: N/A
ENGINEER: OED
DSA NUMBER: 04-119155
CONSULTANT

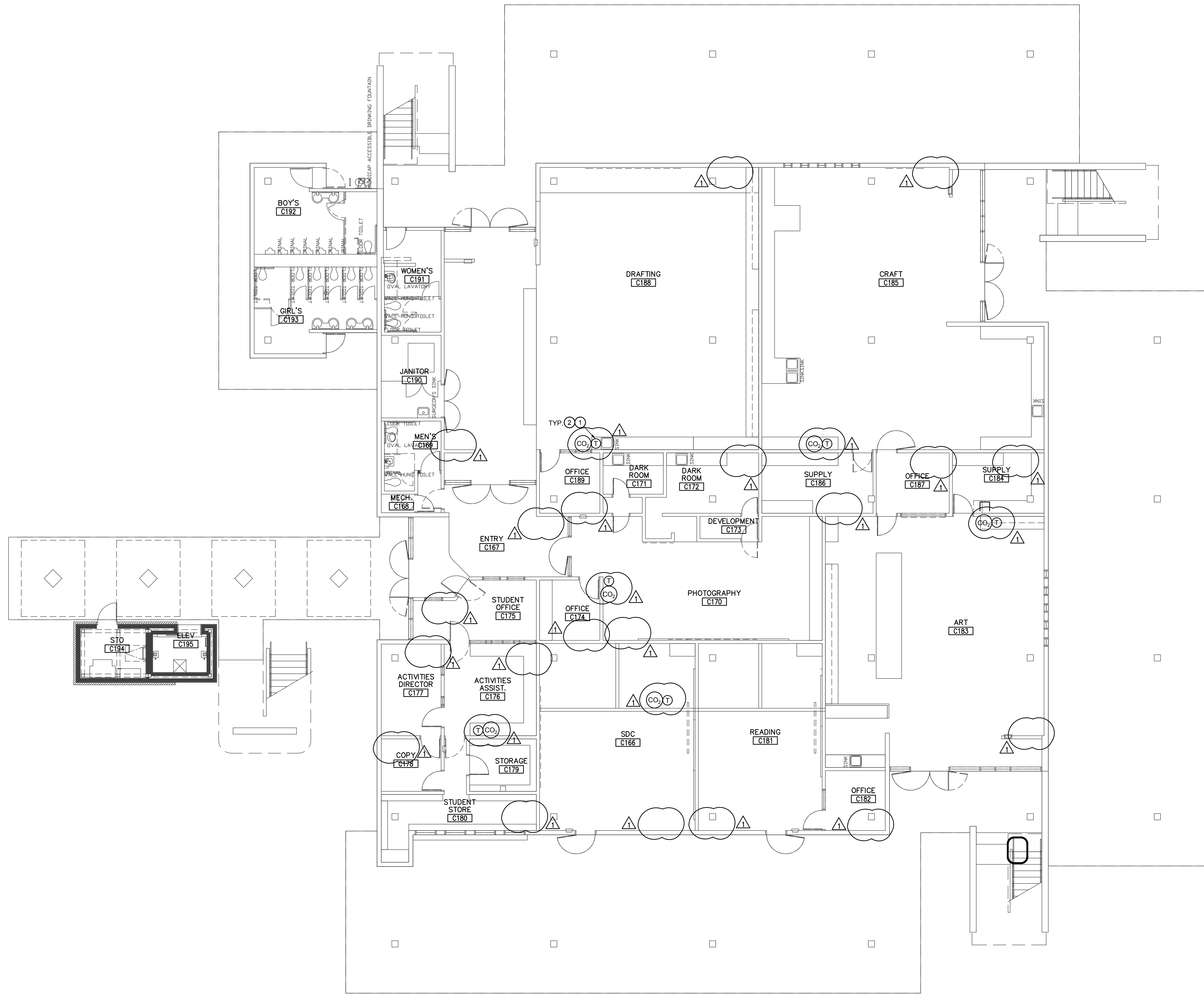
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SHEET DESCRIPTION:
**REMODELLED
SIMS BLDG.
ROOF PLAN**

SHEET NO:
M-1.1

SIM BUILDING REMODEL ROOF PLAN





CONSTRUCTION KEY NOTES:

- 1 ELECTRONIC EMS PROGRAMMABLE THERMOSTAT, MOUNT AT 48" A.F.F.
- 2 CARBON DIOXIDE SENSOR MOUNT AT 48" A.F.F. INTEGRATE INTO FRONT END BMS.

CONSTRUCTION NOTES:

- 1 CONTRACTOR SHALL COORDINATE WORK WITH OTHER TRADES AS NECESSARY PRIOR TO INSTALLATION.
- 2 CONTRACTOR SHALL MAINTAIN PROPER CLEARANCES FROM ALL ELECTRICAL EQUIPMENT AND SERVICE CLEARANCES FOR MECHANICAL EQUIPMENT.

AGENCY APPROVAL



Consulting Engineers
5200 E. La Palma Ave
Anaheim, CA 92807
Telephone (714) 693-2277

STAMP



PROJECT NAME:

NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING
600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

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CONSULTANT

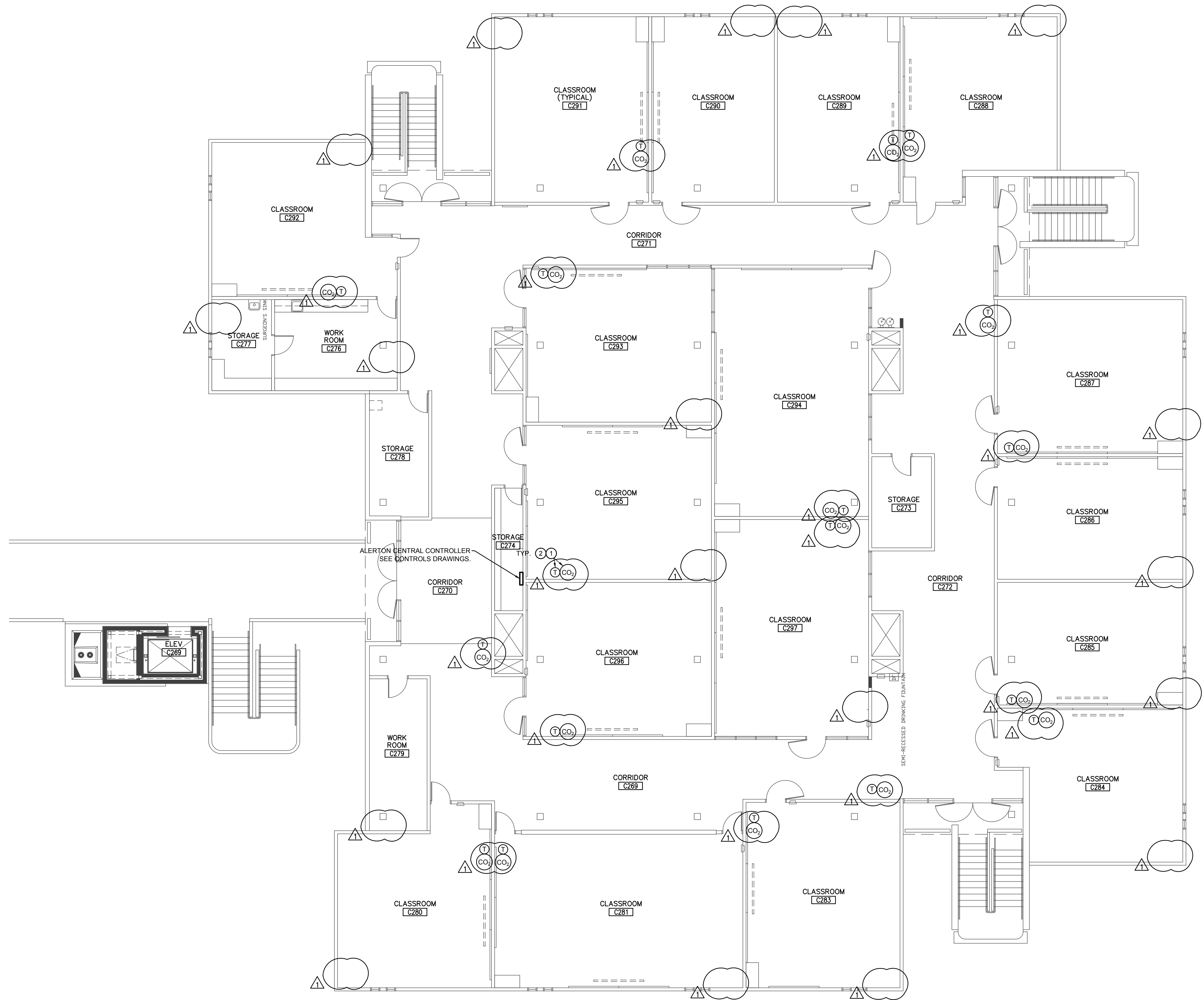
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SHEET DESCRIPTION:

FIRST FLOOR
PLAN REMODEL

SHEET NO:

M-1.2



CONSTRUCTION KEY NOTES:

- 1 ELECTRONIC EMS PROGRAMMABLE THERMOSTAT, MOUNT AT 48" A.F.F.
- 2 CARBON DIOXIDE SENSOR MOUNT AT 48" A.F.F. INTEGRATE INTO FRONT END BMS

CONSTRUCTION NOTES:

- 1 CONTRACTOR SHALL COORDINATE WORK WITH OTHER TRADES AS NECESSARY PRIOR TO INSTALLATION.
- 2 CONTRACTOR SHALL MAINTAIN PROPER CLEARANCES FROM ALL ELECTRICAL EQUIPMENT AND SERVICE CLEARANCES FOR MECHANICAL EQUIPMENT.

AGENCY APPROVAL



Consulting Engineers
5200 E. La Palma Ave
Anaheim, CA 92807
Telephone (714) 693-2277

STAMP



PROJECT NAME:

NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING
600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

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JOB NO: 501-20-0007			
DATE: 2020-06-17			
DRAWN: .. JG			
CHECK: .. HL			
ARCHITECT: N/A			
ENGINEER: OED			
DSA NUMBER: 04-119155			
CONSULTANT			

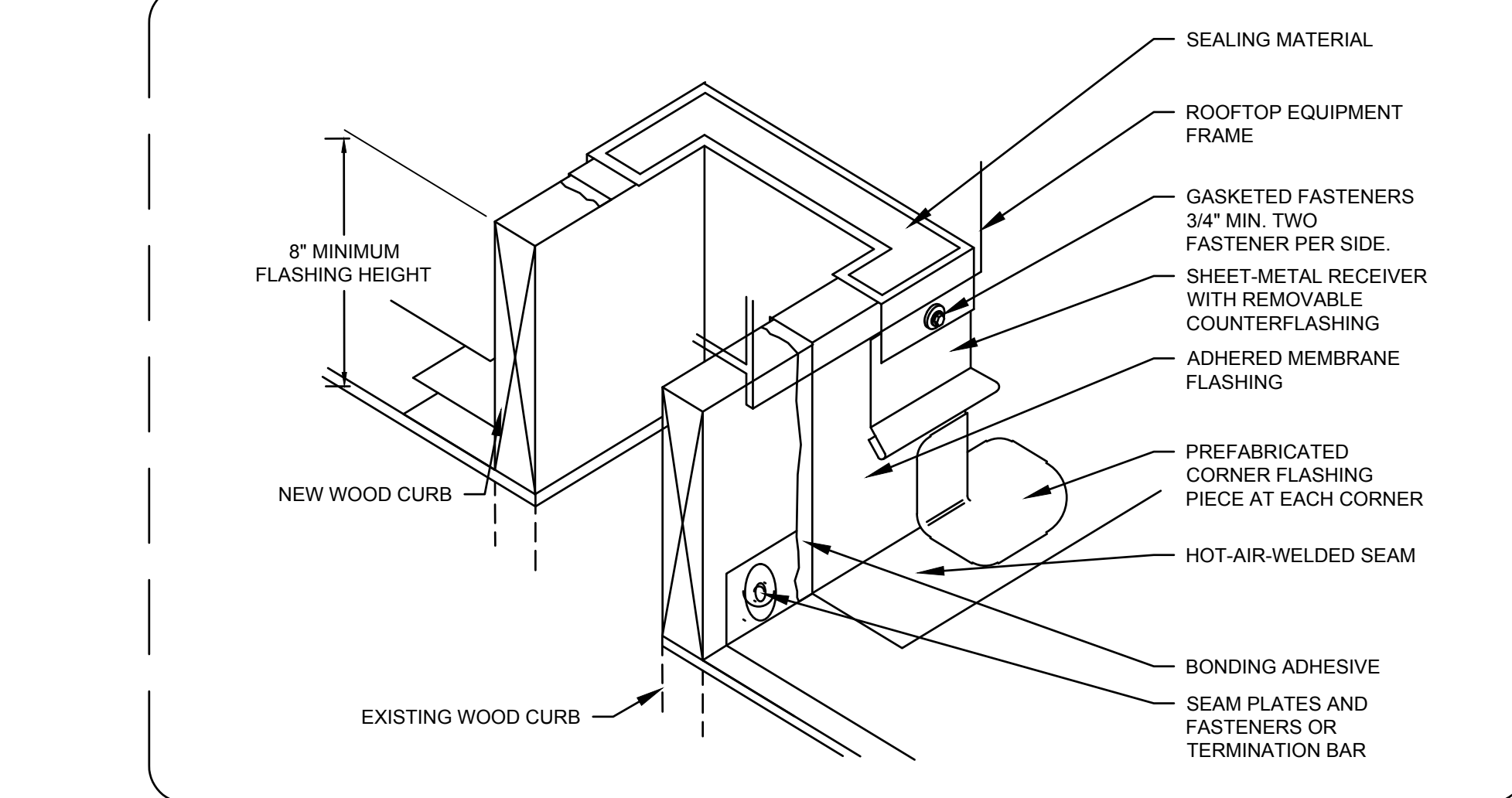
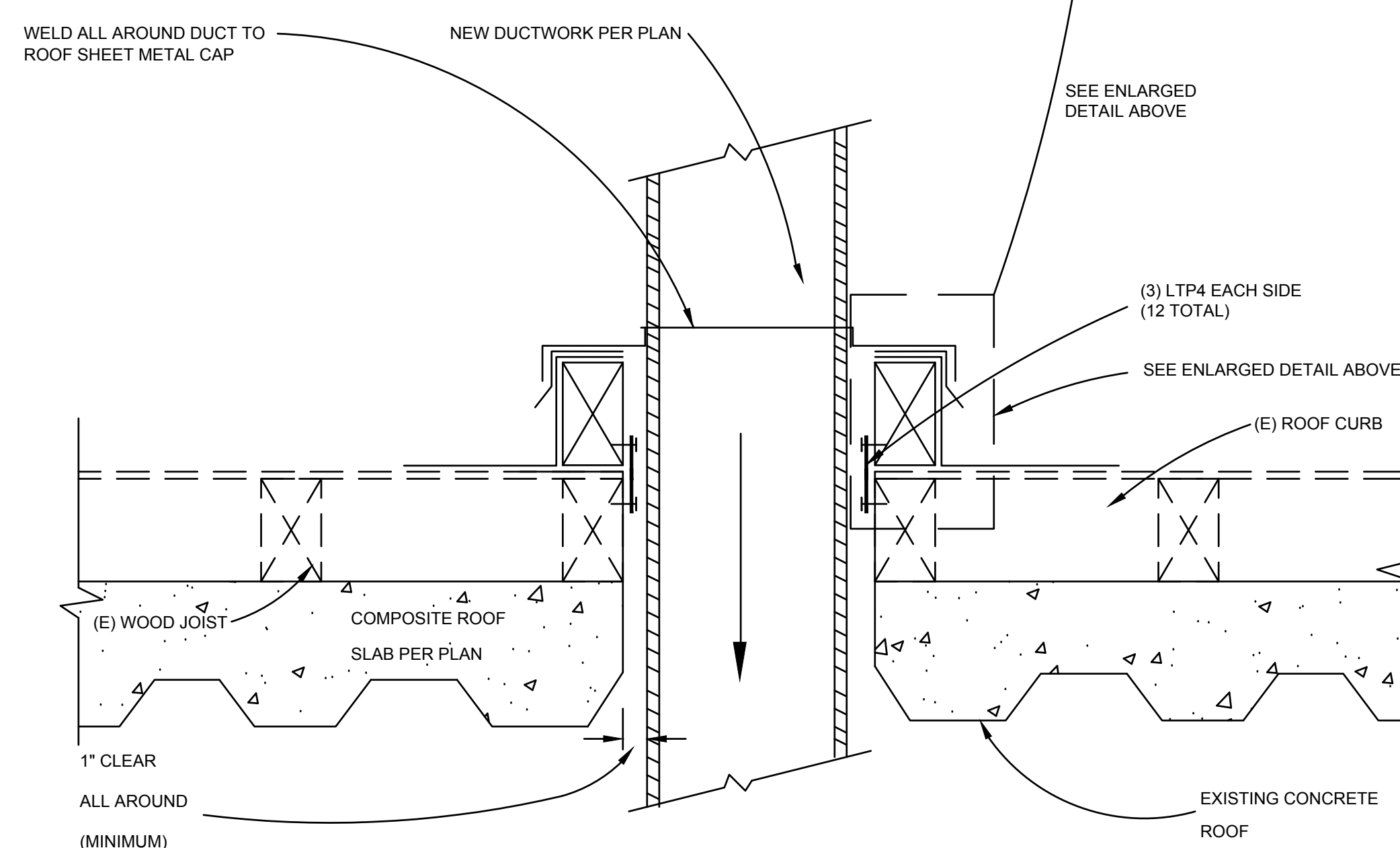
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SHEET DESCRIPTION:

SECOND
FLOOR PLAN
REMODEL

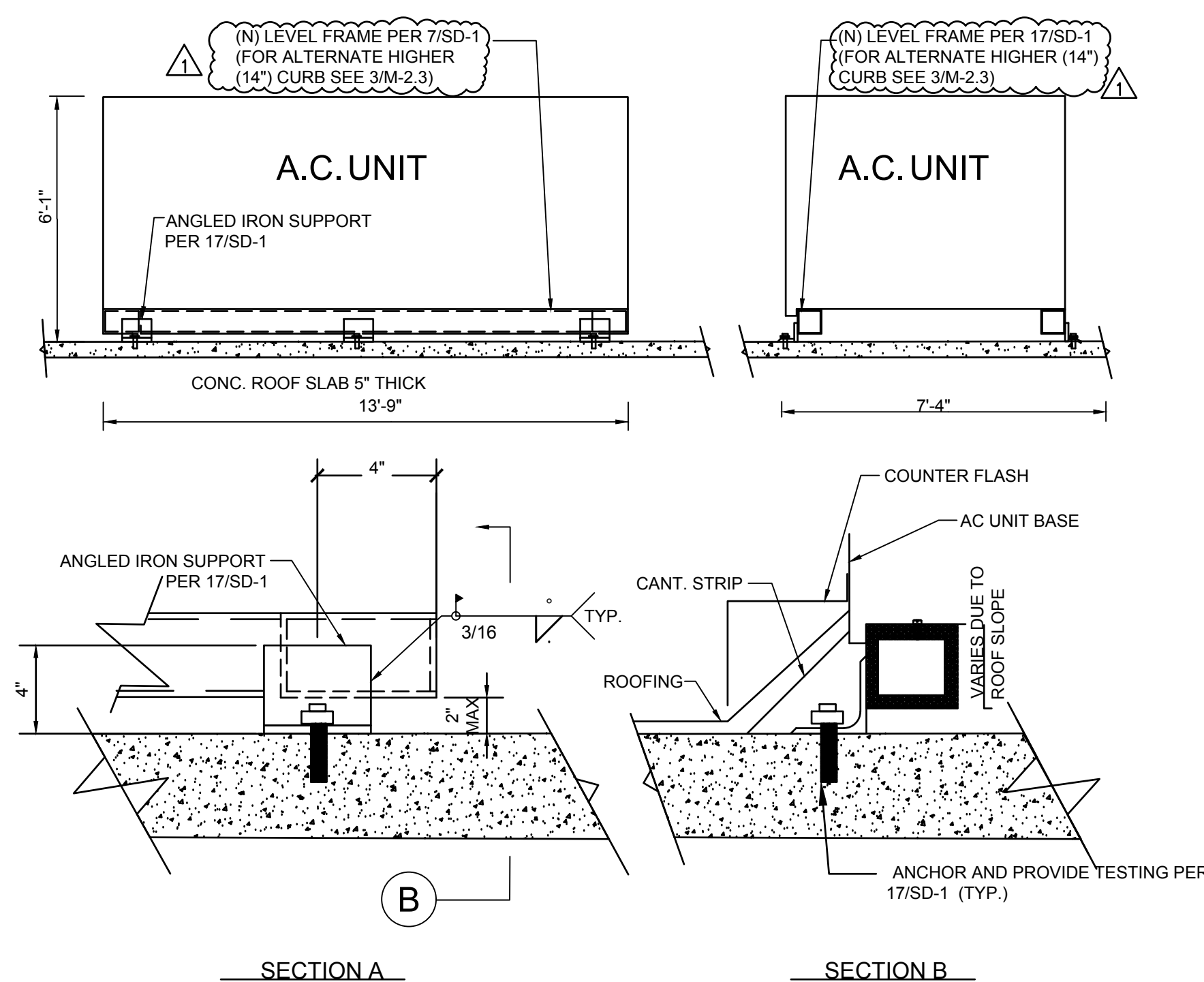
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(E) DUCT THROUGH ROOF DETAIL

SCALE	F
NONE	



A.C. UNIT ANCHORAGE

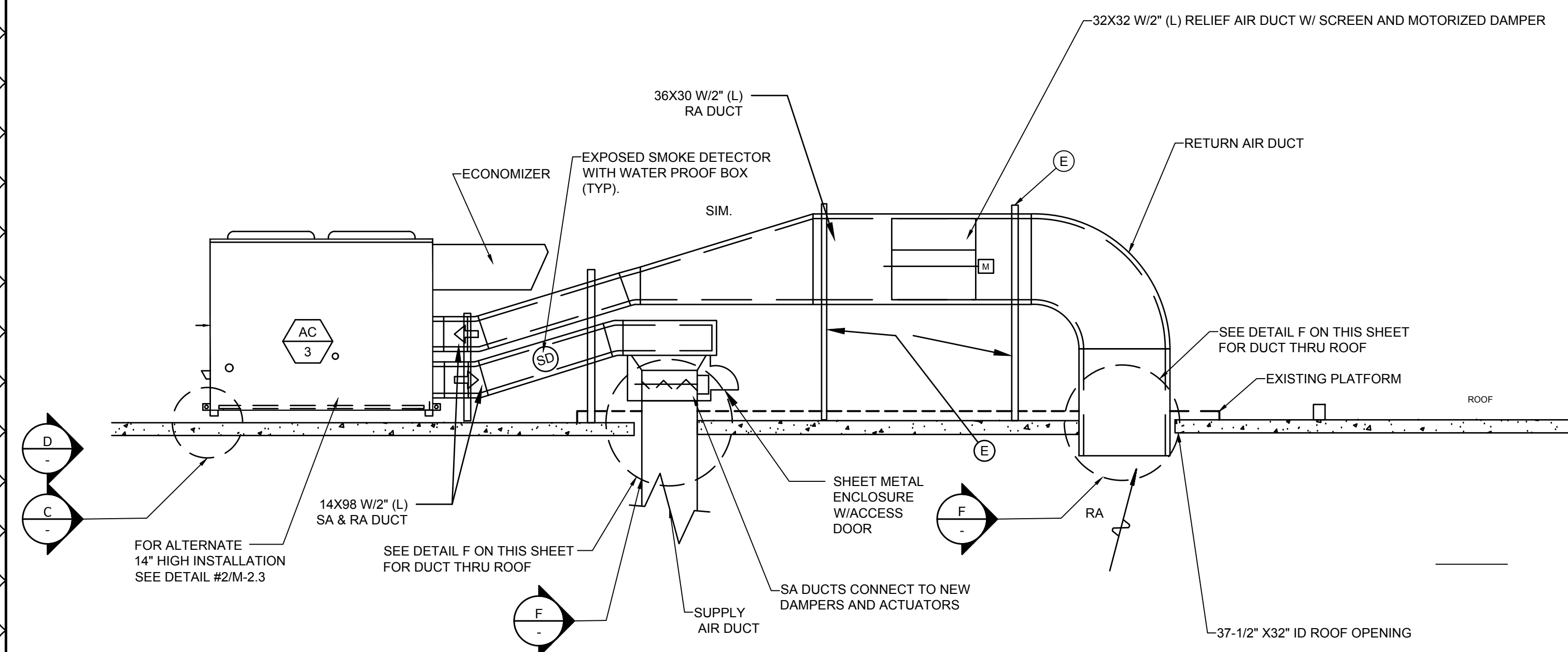
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NOTE:
SEE SD-1 FOR DETAILS

A.C. UNIT ANCHORAGE

SCALE	1
NONE	

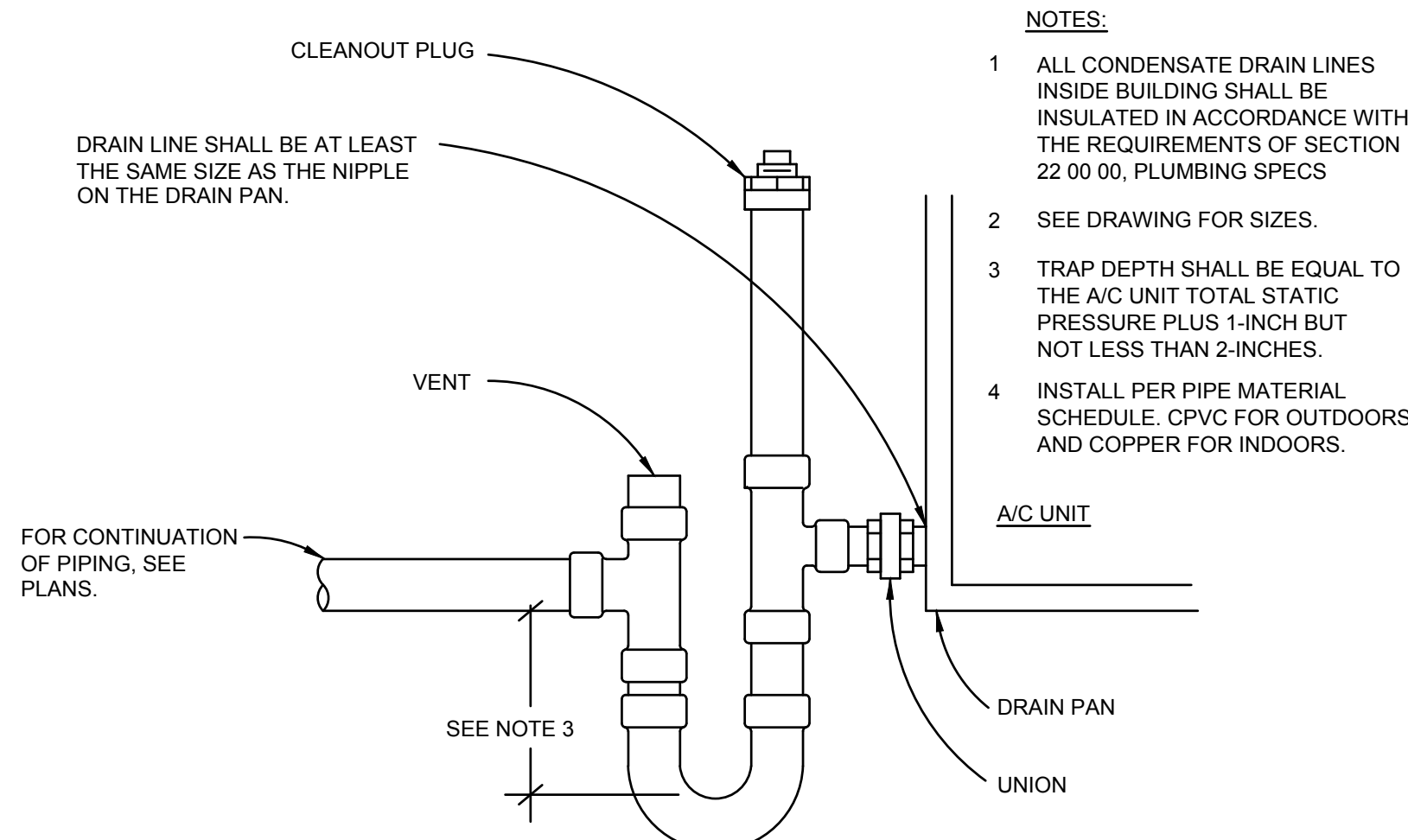


NOTE:

1. SMOKE DETECTOR DUCT MOUNTED WITH WEATHER PROOF ENCLOSURE
2. SUPPORT DUCT 8" O.C.

SECTION

SCALE:	B
NONE	

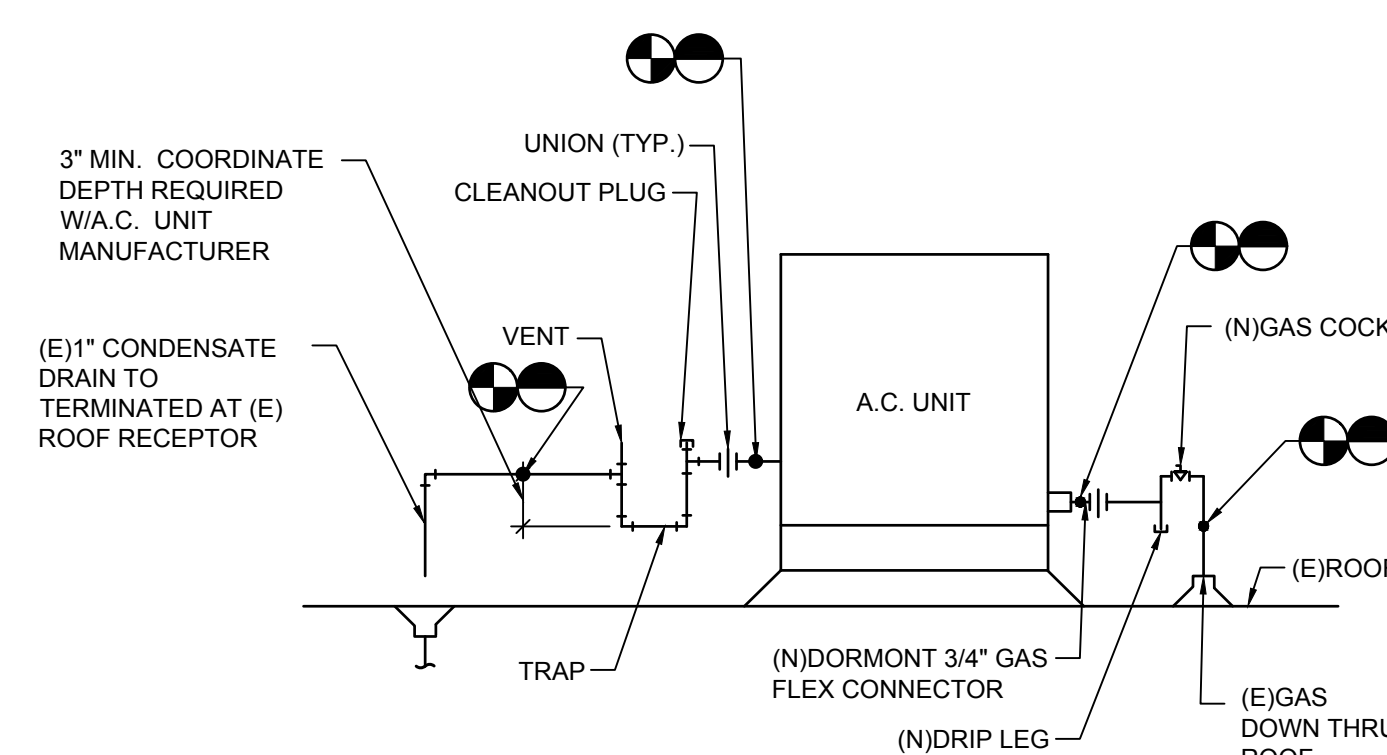


NOTES:

- 1 ALL CONDENSATE DRAIN LINES
INSIDE BUILDING SHALL BE
INSULATED IN ACCORDANCE WITH
THE REQUIREMENTS OF SECTION
22 00 00, PLUMBING SPECS
- 2 SEE DRAWING FOR SIZES.
- 3 TRAP DEPTH SHALL BE EQUAL TO
THE A/C UNIT TOTAL STATIC
PRESSURE PLUS 1-INCH BUT
NOT LESS THAN 2-INCHES.
- 4 INSTALL PER PIPE MATERIAL
SCHEDULE. CPVC FOR OUTDOORS
AND COPPER FOR INDOORS.

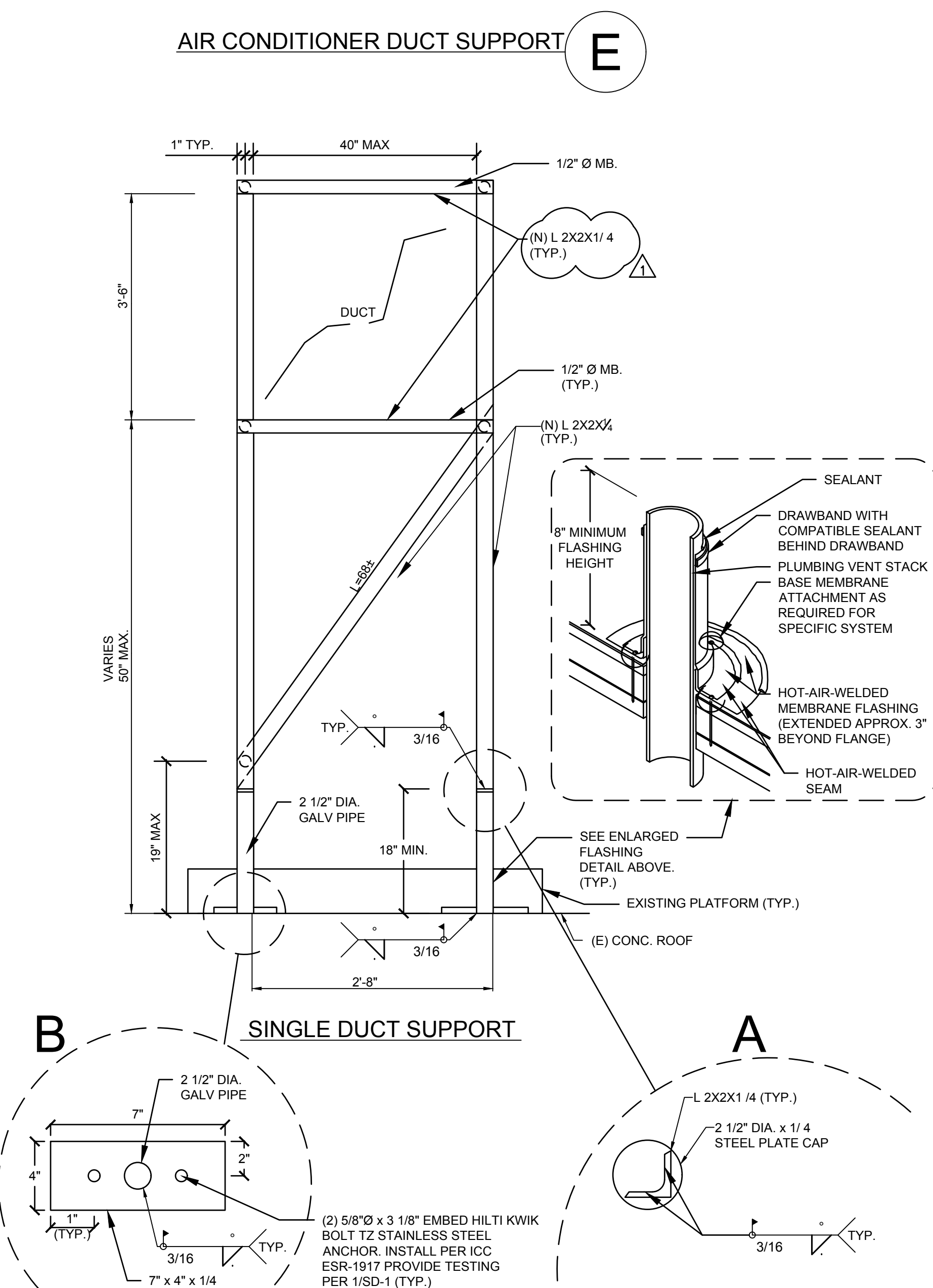
CONDENSATE TRAP DETAIL

NOT TO SCALE	G
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GAS & CD CONNECTIONS OF MECH UNIT ON ROOF

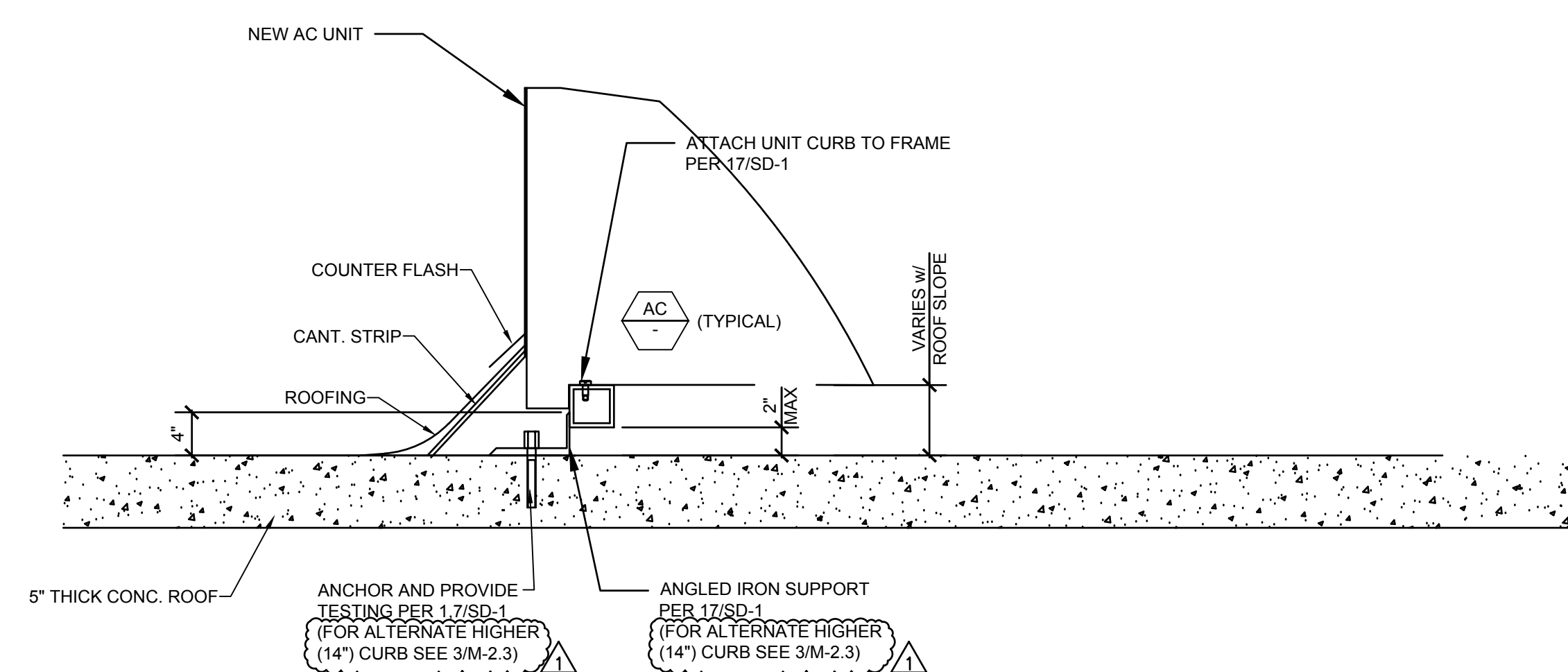
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SINGLE DUCT SUPPORT

AIR CONDITIONING DUCT SUPPORT

SCALE	E
NONE	



NOTE:

SEE SD-1 FOR DETAILS

MOUNTING DETAIL

	SCALE	C
	NONE	



STAMP



PROJECT NAME:

NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING

600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

No.	Rev. Date	Description
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OB NO:	501-20-0007	
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DRAWN:	-- JG	
CHECK:	-- HL	
ARCHITECT:	N/A	
ENGINEER:	OED	
NSA NUMBER:	04-119155	
CONSULTANT		

STAMP

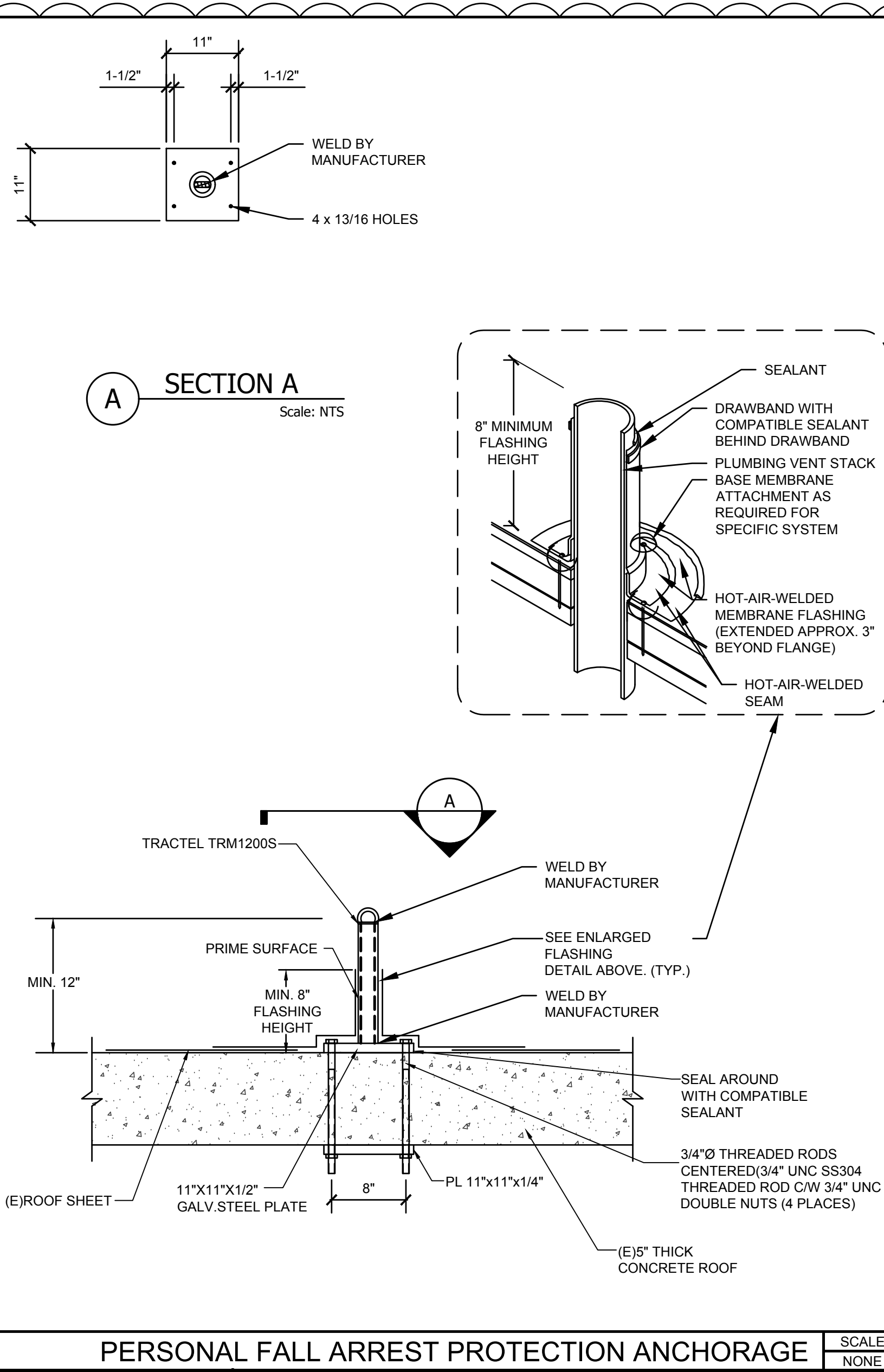
SHEET DESCRIPTION:
MECHANICAL
DETAILS

SHEET NO:
M-2.1



NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING
600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

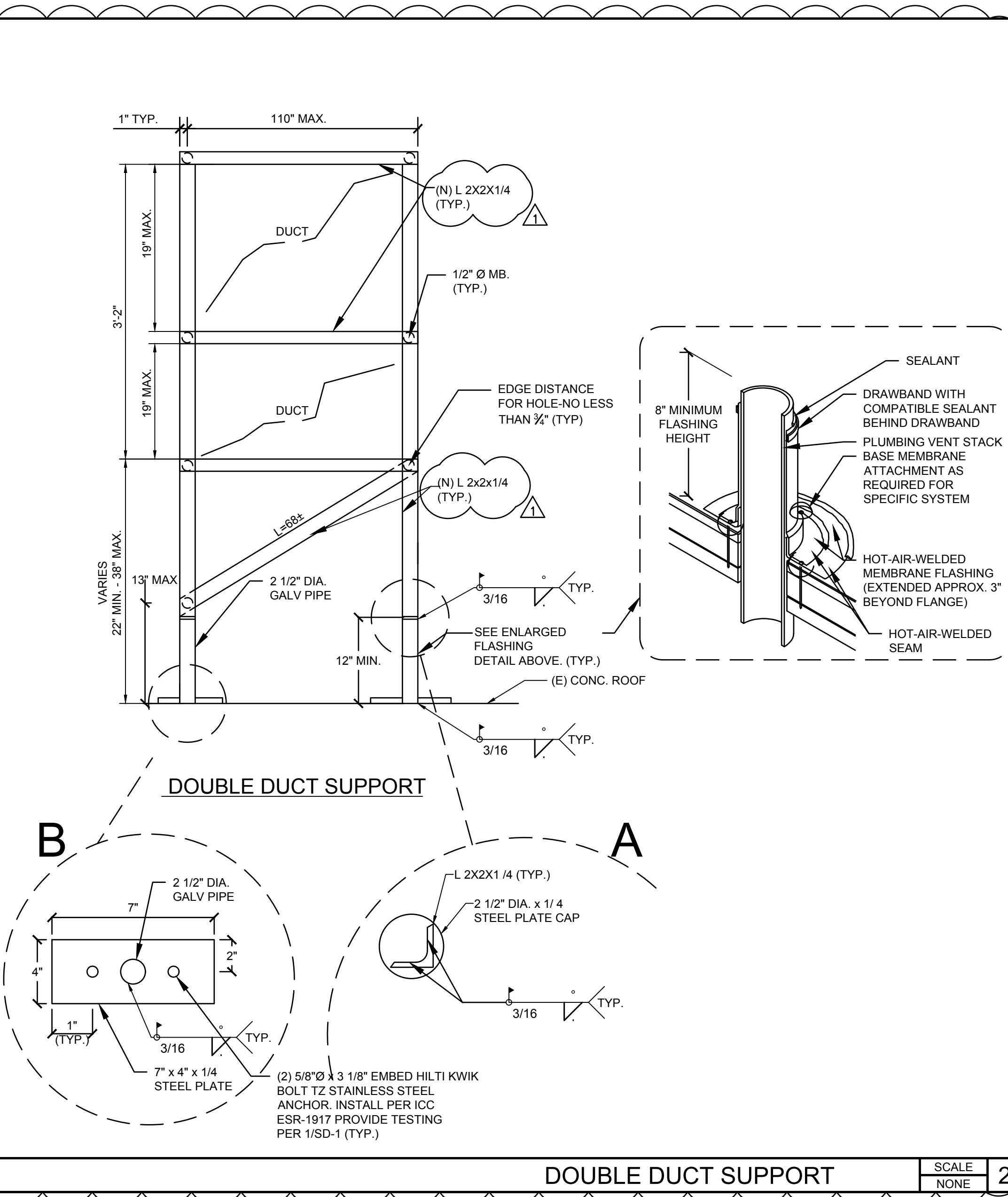
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JOB NO: 501-20-0007			
DATE: 2020-06-17			
DRAWN: -- JG			
CHECK: -- HL			
ARCHITECT: N/A			
ENGINEER: OED			
DSA NUMBER: 04-119155			
CONSULTANT			



PERSONAL FALL ARREST PROTECTION ANCHORAGE

SCALE
NONE

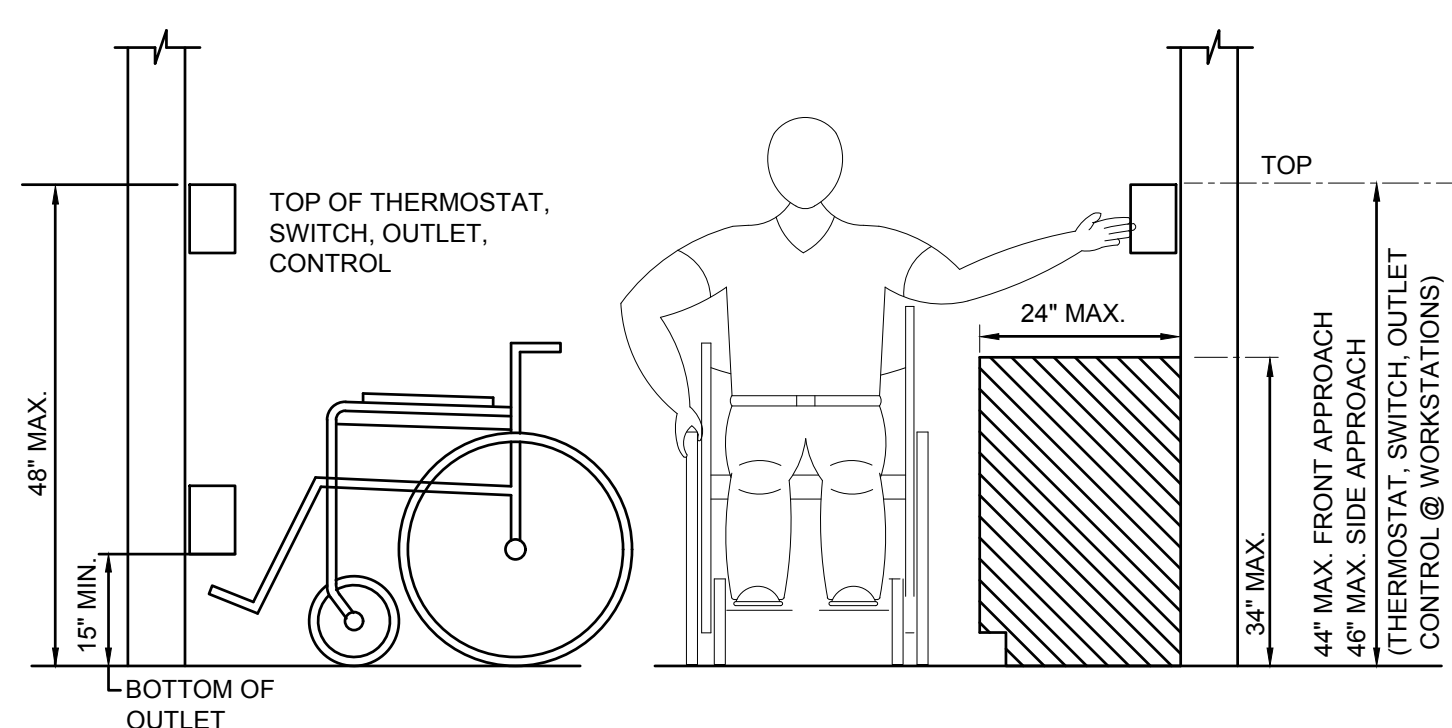
3



DOUBLE DUCT SUPPORT

SCALE
NONE

2



CONTROL DEVICE MOUNTING DETAIL

SCALE
NONE

1

STAMP



PROJECT NAME:

**NEWPORT HARBOR
HIGH SCHOOL SIMS BUILDING**
600 IRVINE AVENUE
NEWPORT BEACH, CA 92663

No.	Rev. Date	Description
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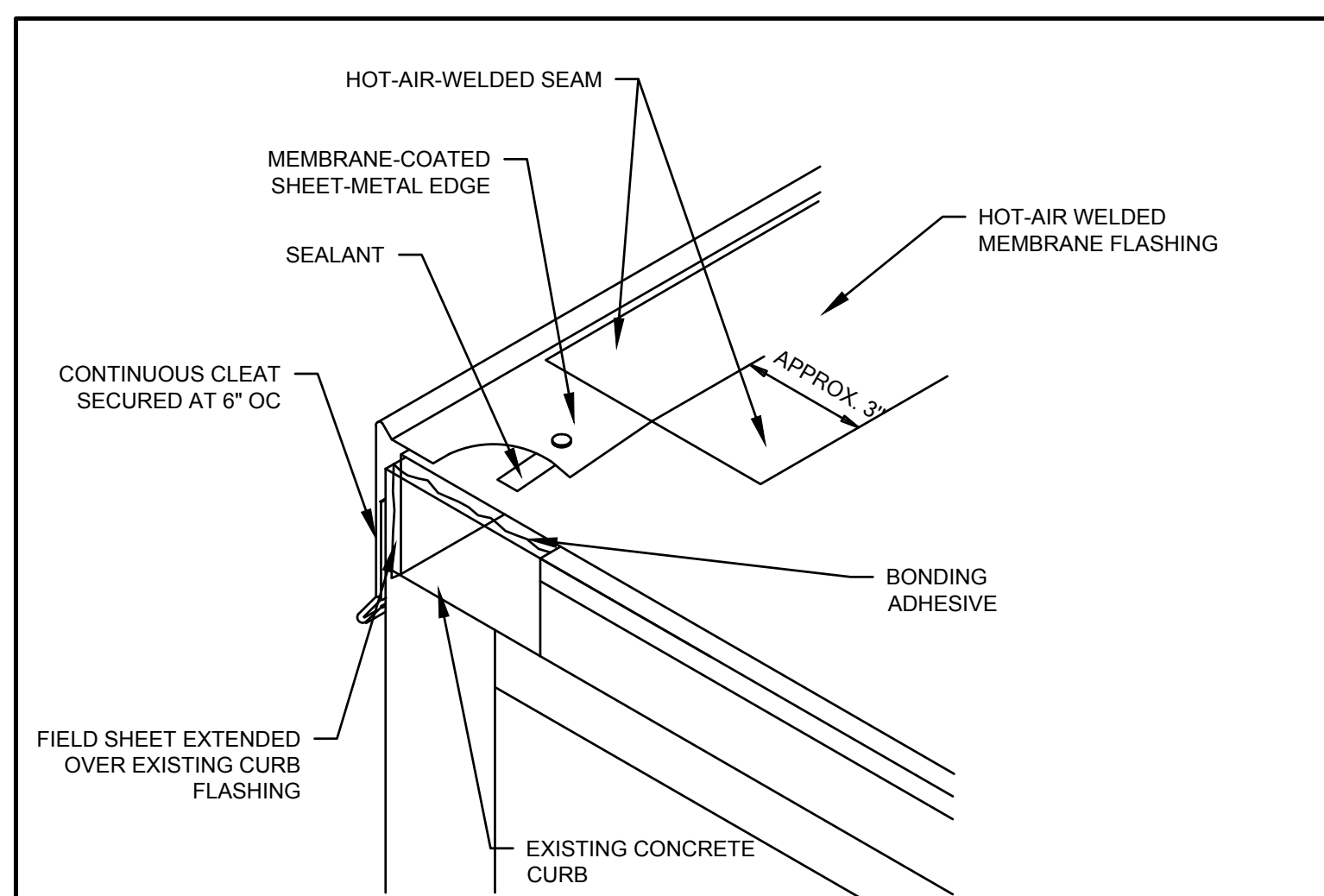
CONSULTANT

STAMP

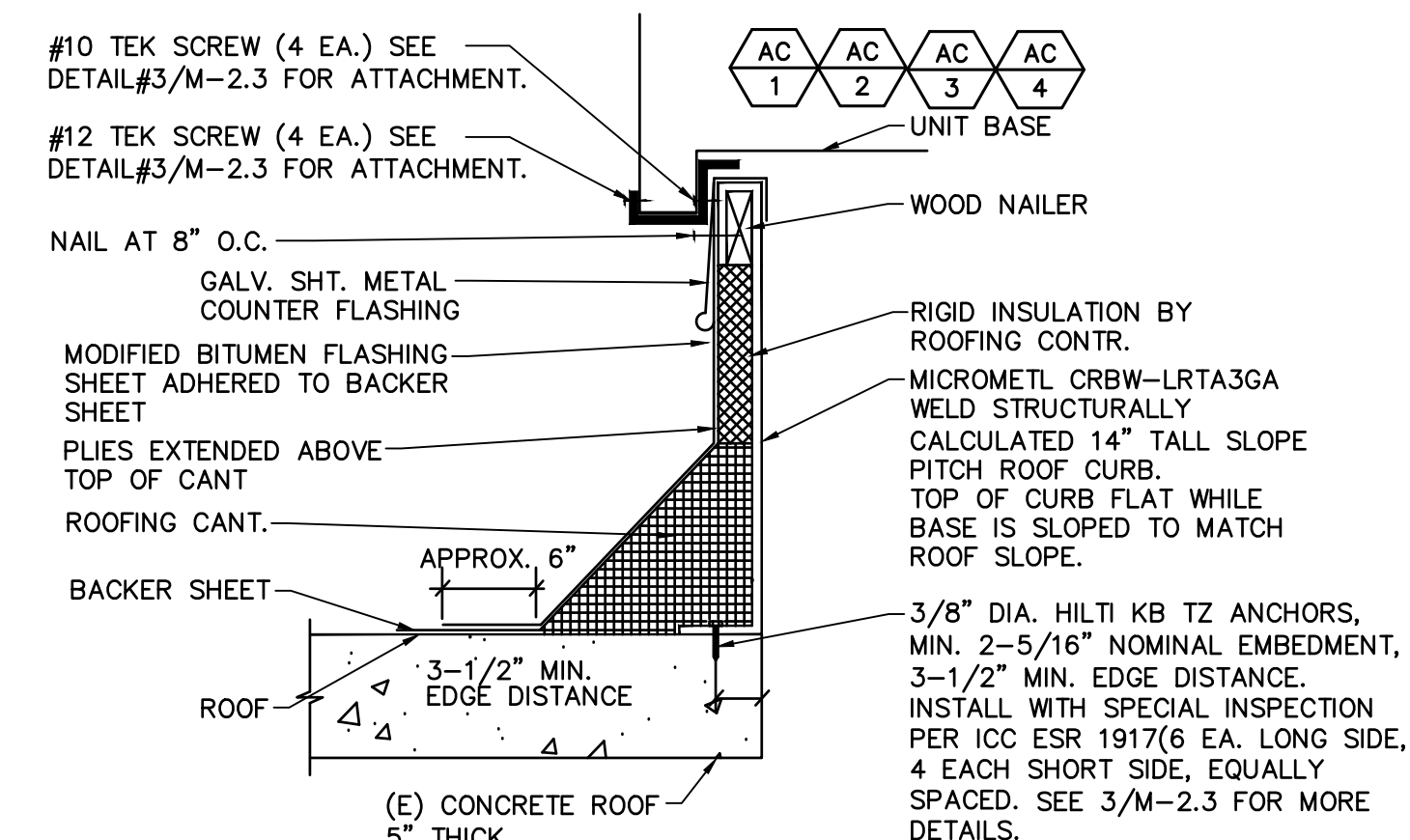
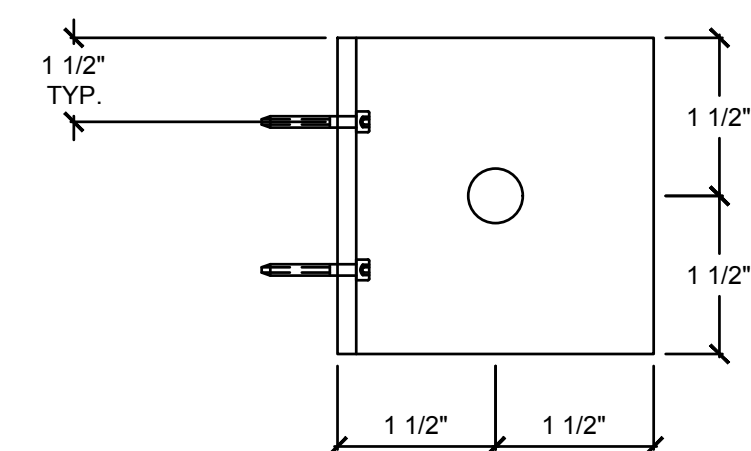
SHEET DESCRIPTION:
**MECHANICAL
DETAILS**

SHEET NO.

M-2.3

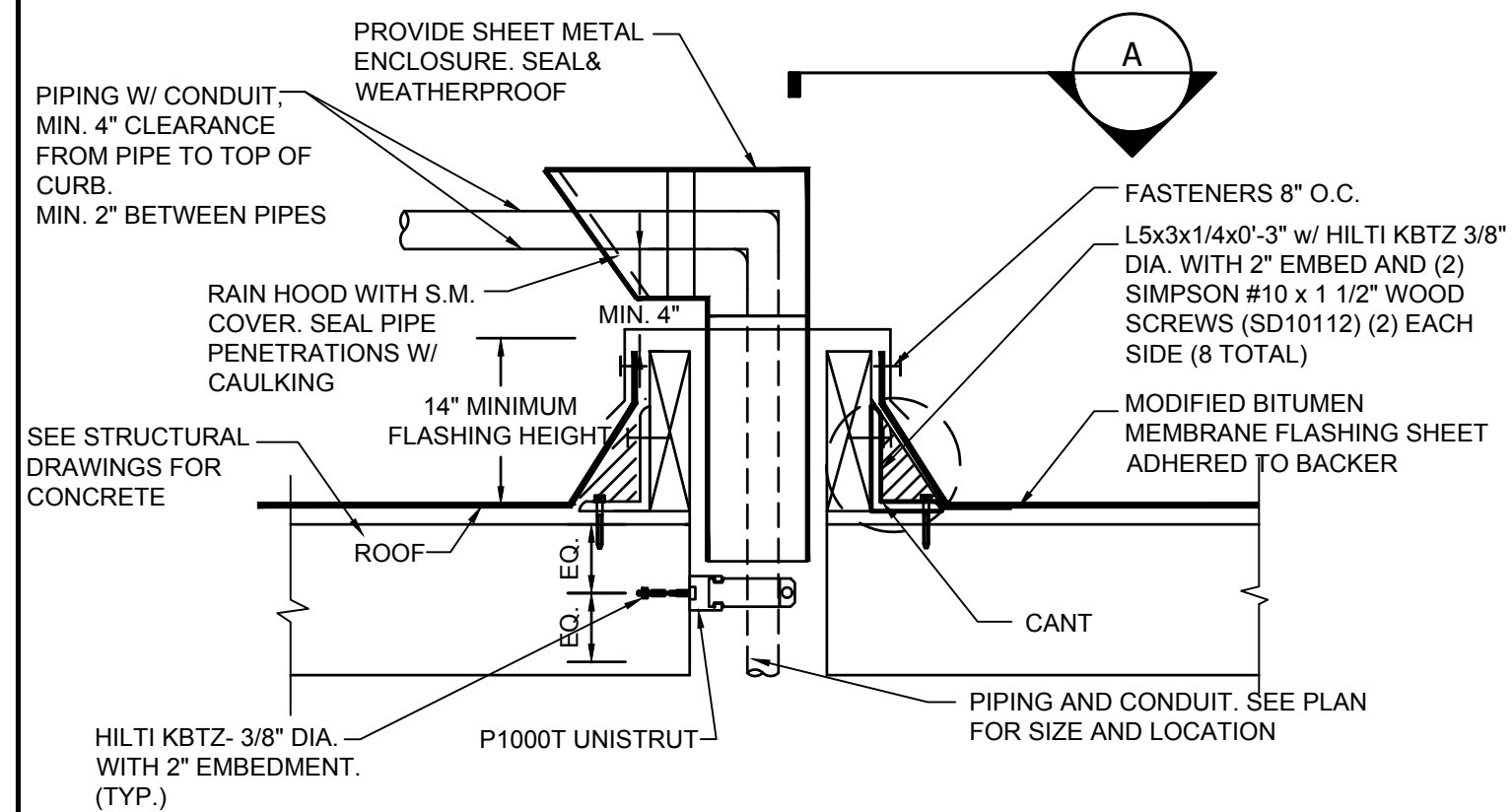
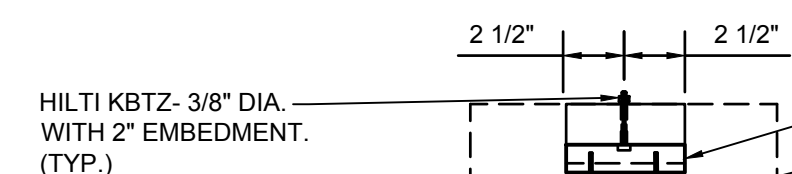
**EMBEDDED EDGE METAL DETAIL FOR PLATFORMS**SCALE
NONE**4**

NOTE:
AC ROOF CURB DIMENSIONS PER AC EQUIPMENT SCHEDULES SHEET
M-0.2 AND EQUIPMENT DATA. INSTALLATION PER MANUFACTURER
GUIDELINES.

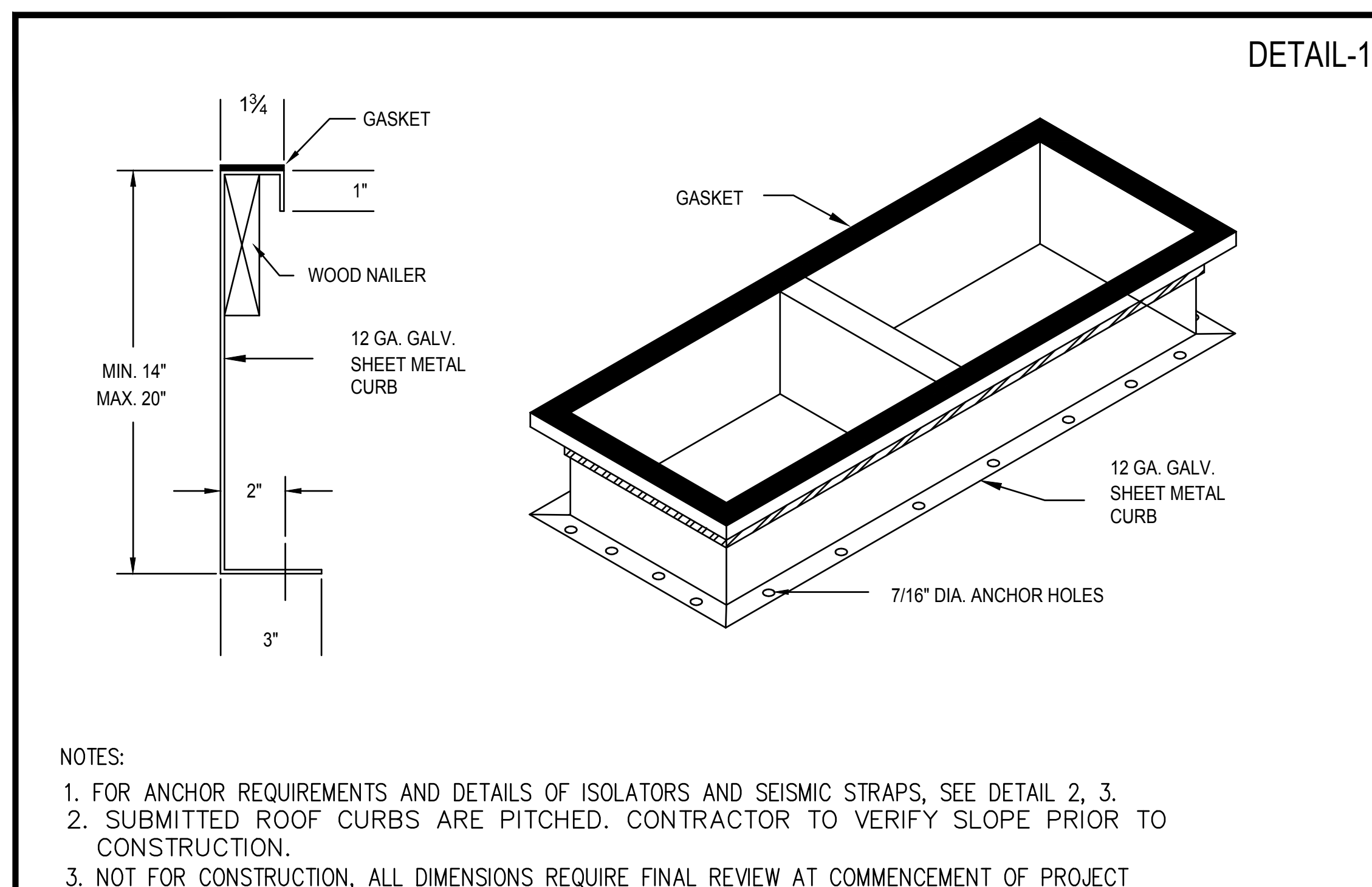
**AC UNIT MOUNTING DETAIL**SCALE
NONE**2****PLAN VIEW**

Scale: NTS

NOTE:
OPENING TO FACE AWAY FROM
PREVAILING WIND.

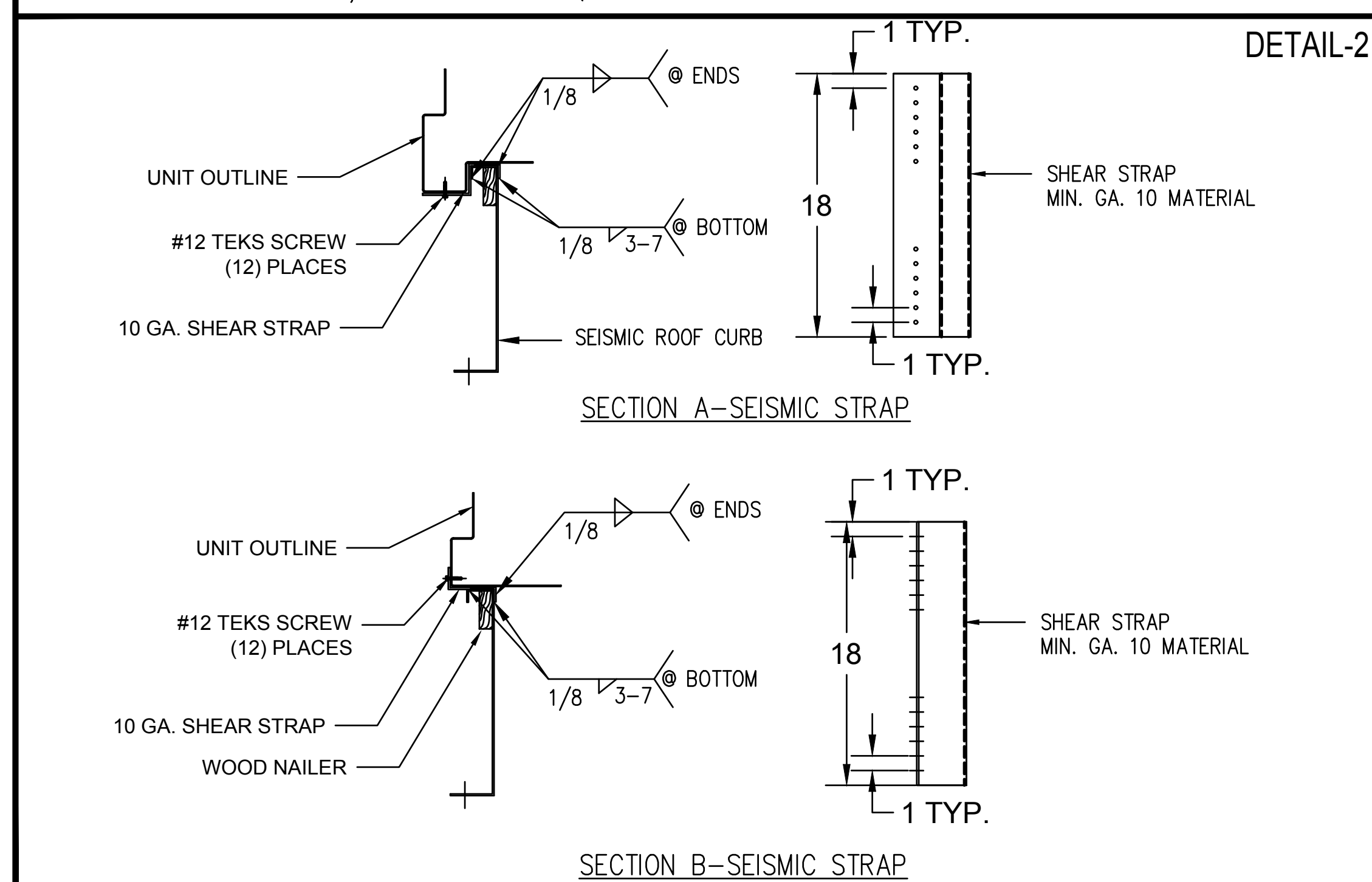
**FRONT VIEW****TOP VIEW**

NOTE:
1. SLOPE PIPES AND CONDUIT
DOWN AND AWAY FROM HOOD.

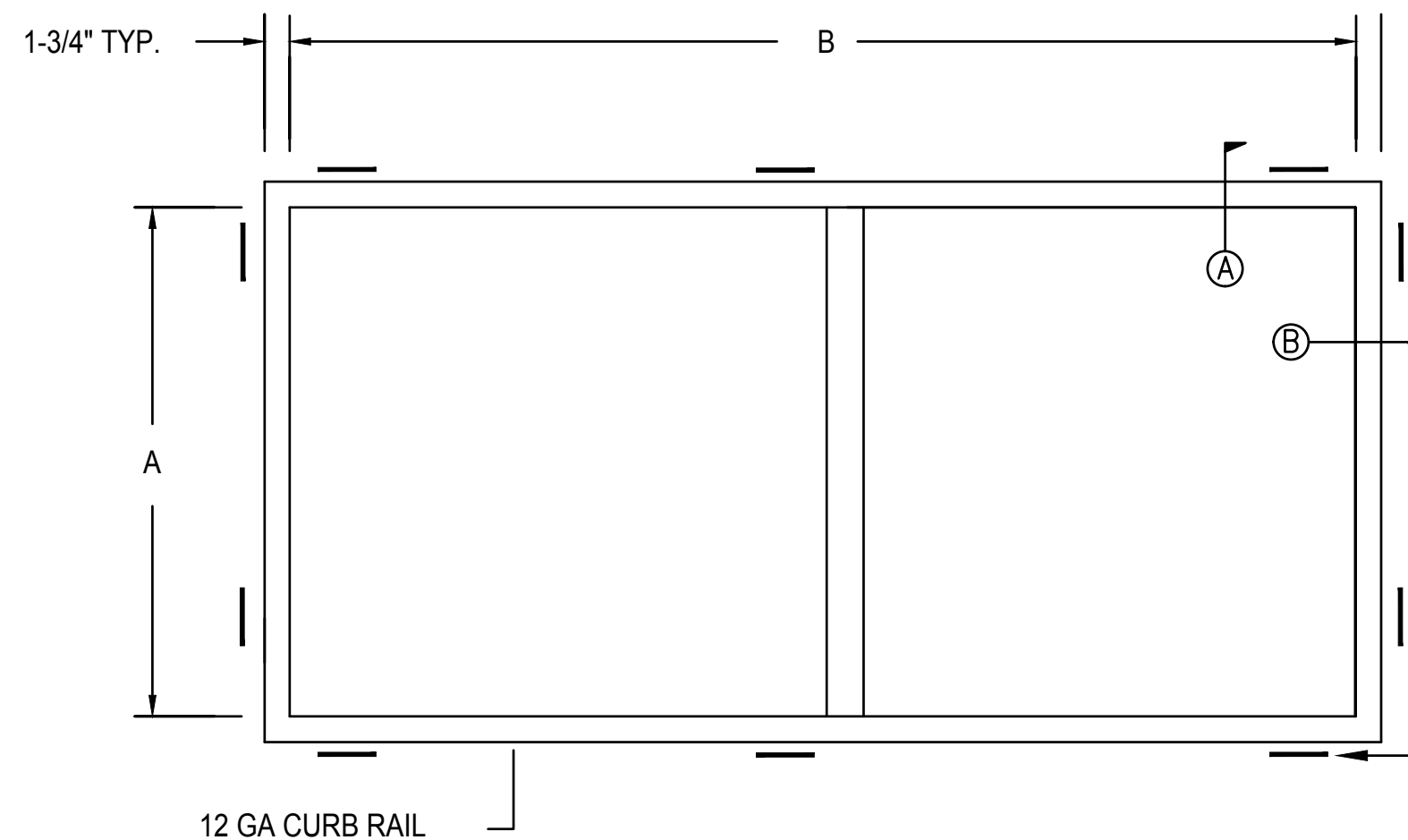
PIPING THRU CONCRETE ROOFSCALE
NONE**1****DETAIL-1**

NOTES:

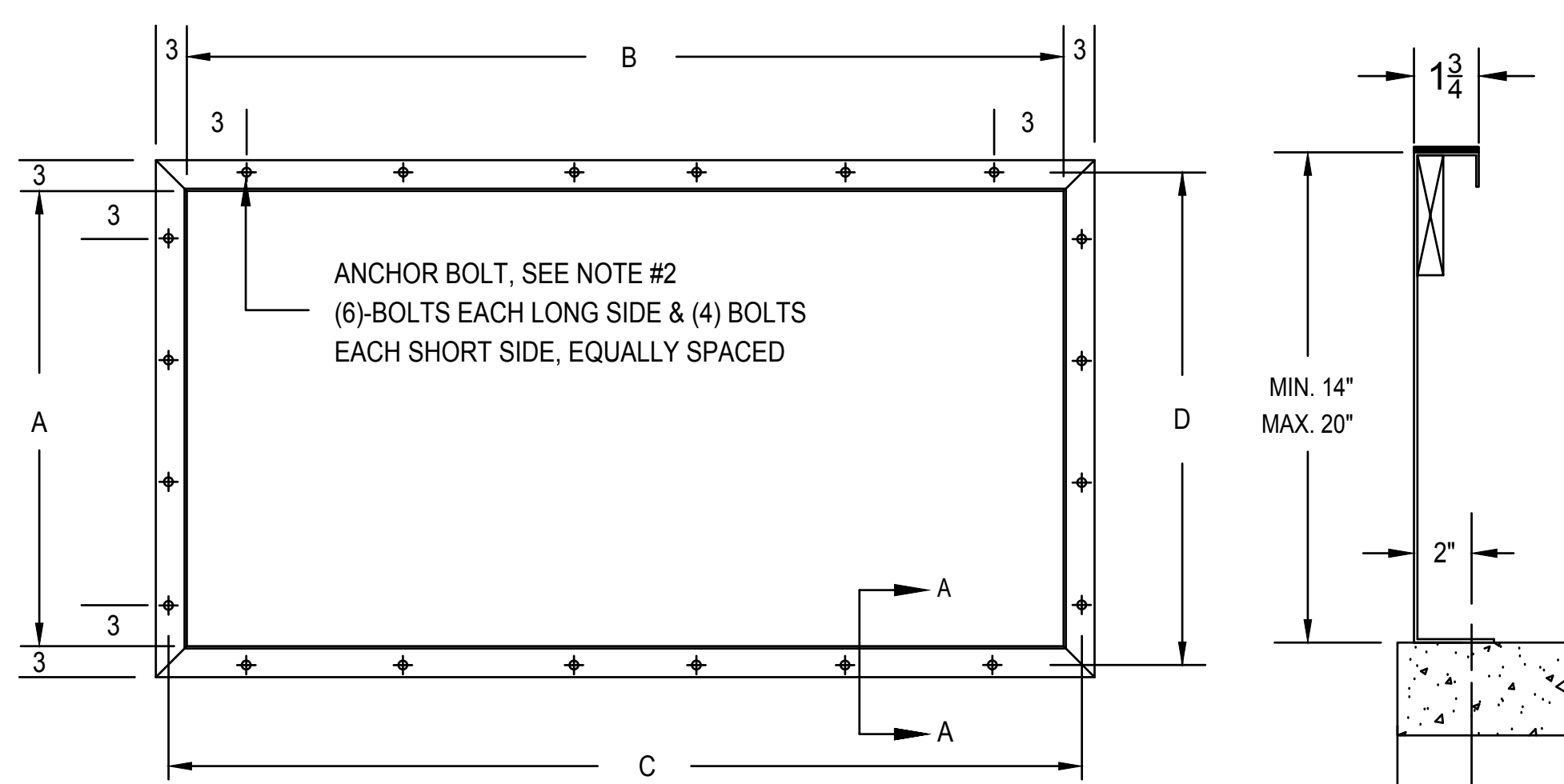
1. FOR ANCHOR REQUIREMENTS AND DETAILS OF ISOLATORS AND SEISMIC STRAPS, SEE DETAIL 2, 3.
2. SUBMITTED ROOF CURBS ARE PITCHED. CONTRACTOR TO VERIFY SLOPE PRIOR TO CONSTRUCTION.
3. NOT FOR CONSTRUCTION, ALL DIMENSIONS REQUIRE FINAL REVIEW AT COMMENCEMENT OF PROJECT

**DETAIL-2**

MARK	MAKE	TYPE	SIZE	SRC WT.
---	CARRIER	48A4/A5	20-35	285#

**SRC TOP VIEW**

A	B	C	D	E
77-3/4	158-15/16	162-15/16	81-3/4	---

**SRC FOOTPRINT**

NOTES:

1. C & D DIMENSIONS ARE CENTERLINES OF ANCHOR HOLES IN CURB BOTTOM FLANGE.
2. DUCT SUPPORTS NOT SHOWN FOR CLARITY.
3. FOR ANCHORAGE, USE 3/8\"/>

SECTION A-A

NOTE:

1. 14\"/>
2. SEE SHEET M-2.4 FOR M.W. SAUSSE CURB CALCULATION.

PRE-FABRICATED CURB DETAILSCALE
NONE**3**

[illegible]

CALCULATIONS FOR Z-TYPE SHEAR STRAP ON ROOF CURB WITH CHANNEL BASE PLATE

FROM CALCULATION SHEET: <C1>

	UPLIFT PER STRAP: P_{min} = 800.00 SHEAR PER STRAP: V_{max} = 19000.00
CHECK NO. OF SKEWS: NO. OF SKEWS PER SIDE: n = 12.00 L1 = 1.68 L2 = 11.00 L3 = 15.00 L4 = 2.00	WITH STRAPS RESISTING SHEAR: TENSION IN SKEW: $T_s = V_{max} * L1 / L2(n+2)$ = 46.46 SHEAR IN SKEW: $V_s = V_{max}/n$ = 1583.33 TRY NO. 12-14 TEEKS SKEW IN MIN. 1/4 GA. METAL Tall = 310.50 Wall = 390.00
CHECK COMBINED LOADING: $T5/Tall + V5/Wall = < L2$	0.29 O.K. II
WITH STRAPS RESISTING UPLIFT: TENSION IN SKEW: $T_s = P_{min}/n$	666.67 310.50 390.00
SHEAR IN SKEW: $V_s = P_{min}/n$	66.67 31.05 39.00
SKEWS OKAY. USE #12-14 TEEKS SKEWS IN MIN. 1/4 GA SHEET METAL CURB.	
CHECK SHEAR STRAP: TRY MIN. 10 GA. PLATE SHEAR STRAP THICKNESS: t AREA: $A = L3 * t$	= 0.13 = 2.42
CHECK FOR BENDING ALONG STRAP: $Mpl = V_{max} * L1$	= 30000.00
$f_b = Mpl/I0(12^3/4^2) < 0.9 F_y$ KSI	= 0.41 O.K. II
CHECK FOR BENDING ACROSS STRAP: $Mpl = P_{min} * L1$	= 15000.00
$f_b = Mpl/I0(12^3/4^2) < 0.9 F_y$ KSI	= 27.64 O.K. II
CHECK FOR SHEARING STRESS: $f_v = V_{max}/A = < 0.4 F_y$ KSI	= 0.66 O.K. II
USE 10 GA. MIN. SHEAR STRAP BENT TO SHAPE	

02/18/2011

REGISTERED PROFESSIONAL ENGINEER
 JAMES D. REED, INC.
 No. 54941
 CIVIL
 STATE OF CALIFORNIA

JOB NAME: NHH5-SM BUILDING	M. W. SAUSSE & CO., INC.
DESIGNED BY:	PREPARED BY: DMW
MECH. ENGR.: OED	DATE: 17-Feb-21
MARK: CARRIER 2D TON	SHEET NO.: <C1>

[illegible]

FULL TENSILE STRENGTH

$$N_u = 2270 \text{ kip (E88, TABLE 5.4.4.5.4)}$$

SHEAR DESIGN STRENGTH

$$\Phi_v \cdot A_v \cdot f_{vR} = \Phi_v \cdot \frac{A_v \cdot f_{vR}}{1.70} = 2660.79 \text{ kip (ANCHOR PULLOUT STRENGTH, 4.3.5.2 OF E88-1977)}$$

ANCHOR PULLOUT STRENGTH

- $A_n = 0.375 \text{ H (OUTSIDE DIAMETER OF ANCHOR BOLT OR ROD)}$
- $C_{60} = 7.5 \text{ H (USE 1.47 C60, C60 IN TABLE 5.4.4 IN E88-1977, INCREASE IF NECESSARY)}$
- $C_{60} = 3.5 \text{ H (USE 1.47 C60, C60 IN TABLE 5.4.4 IN E88-1977, INCREASE IF NECESSARY)}$
- $C_{60} = 2 \text{ H (MIN. V. OF } \Phi_{60} \text{ AC-308 0.621 AND 0.72.5.2)}$
- $C_{60} = 1 \text{ H (USE 1.47 C60, C60 IN TABLE 5.4.4 IN E88-1977, INCREASE IF NECESSARY)}$
- $\Phi_{60} = 4 \text{ H (THICKNESS OF CONCRETE MEMBER)}$
- $0.075 \text{ (SHEAR CONCRETE MEMBER PULLOUT REDUCTION, E88-1977 TABLE 5.4.4)}$
- $1.0 \text{ (TYPICAL COEFFICIENT, E88-1977 TABLE 5.4.4)}$
- $1.2 \text{ (2.0 FOR COIL AND REINFORCEMENT, 1.2 FOR BAR REINFORCEMENT, 1.4 REE 177.5.2.2)}$
- $2 \text{ H (} \Phi_{60} \text{ ACQUIRED WHEN } C_{60} \text{ IS LESS THAN } 177.5.2.2 \text{)}$
- $1 \text{ (NO. OF ANCHORS IN ROW CLOSEST TO CONCRETE EDGE)}$

$$V_u = 0.7 \cdot (0.3 \cdot \Phi_{60} \cdot f_{vR}) = 0.84 \text{ (IF } C_{60} \geq 105 \text{ THEN } = 1.0 \cdot A_v \cdot f_{vR} \text{ SECTION 4.3.5.2)}$$

$$N_u = 1260 \text{ (ANCHOR PULLOUT STRENGTH, 4.3.5.2 OF E88-1977, INCREASE IF NECESSARY)}$$

$$N_u = \min \{ \Phi_{60} \cdot A_v \cdot f_{vR}, 1.2 \cdot N_u \} = 44.0 \text{ H (REFER TO AC-308 0.621 AND 0.72.5.2)}$$

$$N_u = 105 \text{ H (REFER TO AC-308 0.621 AND 0.72.5.2)}$$

$$N_u = 105 \text{ H (REFER TO AC-308 0.621 AND 0.72.5.2)}$$

$$V_u = \left(\frac{1}{2} \cdot \frac{A_v \cdot f_{vR}}{1.70} \right) \cdot \left(\frac{1}{2} \cdot \frac{A_v \cdot f_{vR}}{1.70} \right) = 220.21 \text{ OR } V_u = \left(\frac{1}{2} \cdot \frac{A_v \cdot f_{vR}}{1.70} \right) = 3306.81$$

$$V_u = \frac{A_v \cdot f_{vR}}{1.70} = 1500.34 \text{ H (REFER TO AC-308 0.621 AND 0.72.5.2)}$$

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$$V_u = \frac{A_v \cdot f_{vR}}{1.70} = 1500.34 \text{ H (REFER TO AC-30$$

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CHECK:	...HL
ARCHITECT:	N/A
ENGINEER:	OED
DSA NUMBER:	04-119155

NEWPORT HARBOR HIGH SCHOOL
NEWPORT MESA UNIFIED SCHOOL DISTRICT
DSA SUBMITTAL
OED JOB #501-20-0007

HVAC ALERTON EMS
DECEMBER 22, 2020
SEQUENCE OF OPERATIONS (1)

SEQUENCE OF OPERATION

VAV A/C UNIT CONTROL:

THE VAV AC UNIT CONTROLLER AND ALL INTERNAL CONTROL DEVICES ARE FURNISHED, INSTALLED, PROGRAMMED AND COMMISSIONED BY THE UNIT MANUFACTURER.

UNIT SEQUENCE OF OPERATION IS THE SOLE RESPONSIBILITY OF THE UNIT MANUFACTURER.

BAS SYSTEM SHALL READ/ WRITE TO AVAILABLE CONTROLLER INPUT/OUTPUT PARAMETERS, POINTS, ALARMS, SCHEDULES AND SETPOINTS VIA BACNET.

START/STOP CONTROL

THE AC UNIT SHALL BE STARTED AND STOPPED BASED UPON THE PROGRAMMABLE OCCUPANCY SCHEDULE OF THE DOWNSTREAM ZONES.

DURING UNOCCUPIED PERIODS, IF AN AFTERHOUR REQUEST IS ACTIVE THE AC UNIT WILL BE STARTED FOR A DURATION OF 2 HOURS.

SUPPLY AIR TEMPERATURE MODE CONTROL

THE CONTROLLER WILL DETERMINE HEATING OR COOLING MODE BASED UPON THE HEATING/ COOLING REQUESTS FROM THE ASSOCIATED VAV ZONES. THE HEATING OR COOLING MODE WILL BE SENT TO THE AC UNIT OEM CONTROLLER VIA BACNET.

SUPPLY AIR TEMPERATURE CONTROL

THE CONTROLLER WILL DETERMINE SUPPLY AIR COOLING SETPOINT BASED UPON THE COOLING REQUESTS FROM THE ASSOCIATED VAV ZONES. THE SUPPLY TEMPERATURE CONTROL LOOP WILL STAGE ON THE DX COOLING IN SEQUENCE TO MAINTAIN THE CALCULATED SUPPLY AIR TEMPERATURE SETPOINT. THE INITIAL COOLING SETPOINT SHALL BE 60°F AND SHALL RESET FROM 72°F (ADJ.) TO 52°F (ADJ.) AS ZONE COOLING REQUESTS GO FROM ZERO TO MAXIMUM (ALL ZONES REQUIRING COOLING).

THE CONTROLLER WILL DETERMINE SUPPLY AIR HEATING SETPOINT BASED UPON THE HEATING REQUESTS FROM THE ASSOCIATED VAV ZONES. THE SUPPLY TEMPERATURE CONTROL LOOP WILL STAGE ON THE HEATING IN SEQUENCE TO MAINTAIN THE CALCULATED SUPPLY AIR TEMPERATURE SETPOINT. THE INITIAL HEATING SETPOINT SHALL BE 90°F AND SHALL RESET FROM 72°F (ADJ.) TO 120°F (ADJ.) AS ZONE HEATING REQUESTS GO FROM ZERO TO MAXIMUM (ALL ZONES REQUIRING HEATING).

SUPPLY DUCT STATIC PRESSURE CONTROL

SUPPLY DUCT STATIC PRESSURE SHALL BE CONTROLLED VIA THE AC UNIT FACTORY FURNISHED CONTROLS.

ECONOMIZER CONTROL

UNIT FACTORY ECONOMIZER SHALL BE CONTROLLED VIA THE AC UNIT FACTORY FURNISHED CONTROLS. THE ECONOMIZER POSITION SHALL BE OVERRIDDEN TO INCREASE OUTSIDE AIR INTAKE IF REQUIRED BY DOWNSTREAM ZONES DEMAND BASED VENTILATION (CO2) REQUIREMENTS.

ZONE DAMPER CONTROL

EACH ZONE WILL BE ACTIVATED BY AN OCCUPIED COMMAND FROM A USER DEFINED SCHEDULE OR AN AFTER HOUR OVERRIDE INITIATED AT THE SPACE SENSOR. IF ANY ZONE IS COMMANDED TO OCCUPIED MODE THEN ALL OTHER ZONES OF THE UPSTREAM AC UNIT WILL BE PUT IN OCCUPIED MODE TO ENSURE ADEQUATE AIR FLOW/LOAD ON THE UNIT.

EACH ZONE WILL MONITOR THE HEATING/ COOLING MODE OF THE UPSTREAM AC UNIT. THE ZONE TEMPERATURE CONTROL LOOP WILL OPERATE IN DIRECT ACTING MODE WHEN THE UNIT IS IN COOLING AND AUTOMATICALLY SWITCH TO REVERSE ACTING MODE WHEN THE UNIT IS IN HEATING.

THE SPACE TEMPERATURE PI CONTROL LOOP WILL MODULATE THE ZONE DAMPER TO MAINTAIN A SPACE TEMPERATURE SETPOINT OF 72°F (ADJ.).

THE ZONE CONTROLLER WILL SEND A FLAG (VIA BACNET) TO THE UPSTREAM AC UNIT TO REQUEST HEATING OR COOLING DEPENDING ON ZONE TEMPERATURE CONDITION.

DEMAND-BASED VENTILATION CONTROL

THE CONTROLLER SYSTEM SHALL MONITOR THE SPACE CARBON DIOXIDE LEVELS. UPON A RISE IN SPACE CO2 ABOVE 1000 PPM (ADJ.), THE CONTROL SYSTEM SHALL INCREASE AIRFLOW TO THE SPACE BY 20% (ADJ.). IF THE SPACE CO2 LEVELS DO NOT DROP BELOW THE SPACE CO2 SETPOINT A COMMAND IS SENT TO THE UPSTREAM AC UNIT (VIA BACNET) TO MODULATE THE ECONOMIZER DAMPERS TO INCREASE OUTSIDE AIR FLOW.

ZONE ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH SPACE TEMP: IF THE SPACE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY MORE THAN 5°F (ADJ.).
- LOW SPACE TEMP: IF THE SPACE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY MORE THAN 5°F (ADJ.).

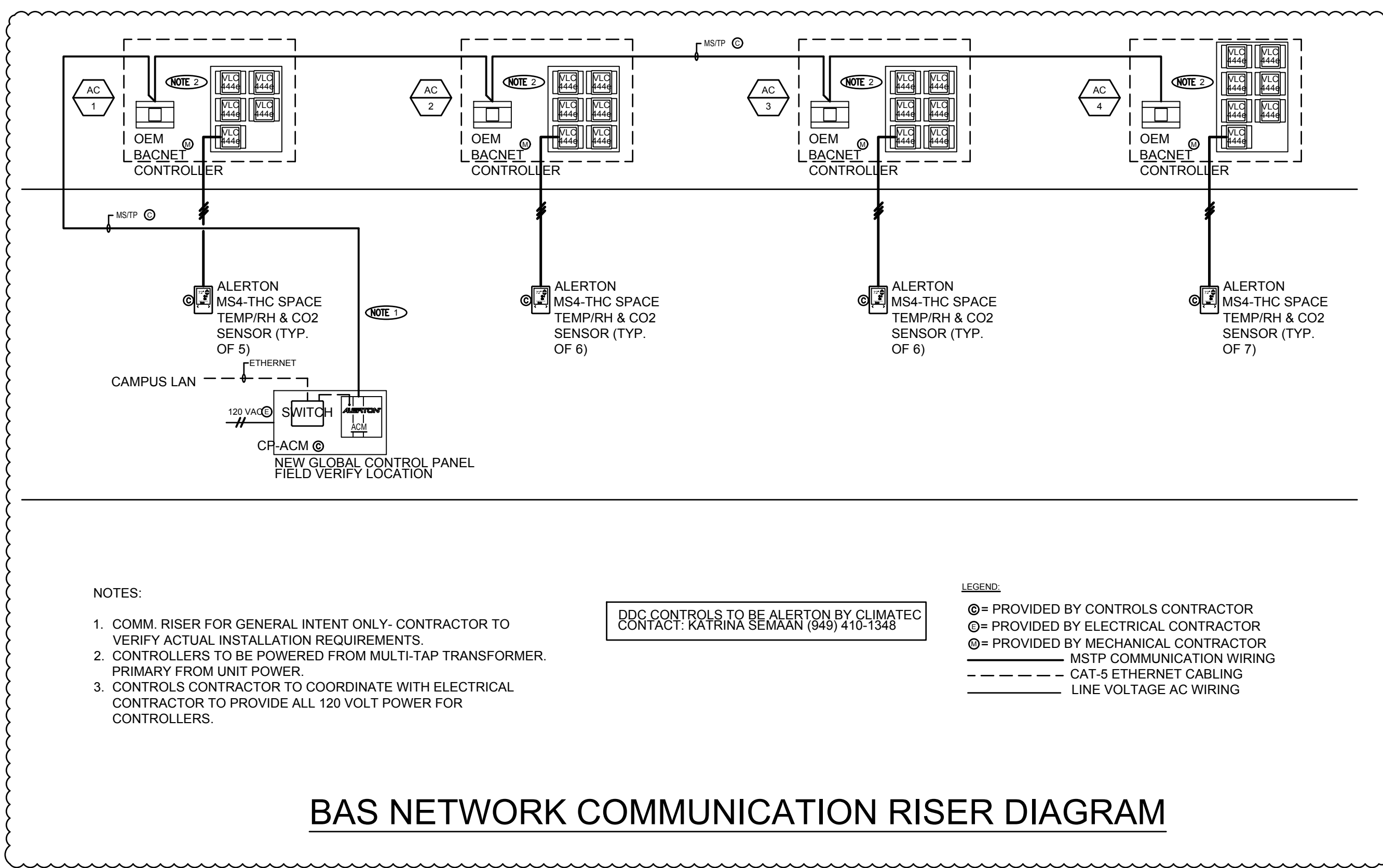
TRENDING OF ZONE TEMPERATURE AND CO2 LEVELS:

- SPACE TEMPERATURE SHALL BE MONITORED AND RECORDED AT A 10 MINUTE (ADJ.) SAMPLE RATE.
- SPACE CO2 LEVEL SHALL BE MONITORED AND RECORDED AT A 10 MINUTE (ADJ.) SAMPLE RATE.
- SYSTEM SHALL INCLUDE CAPABILITY TO ARCHIVE NOT LESS THAN 24 CONSECUTIVE MONTHS OF HISTORICAL DATA FOR ALL TRENDED POINTS.

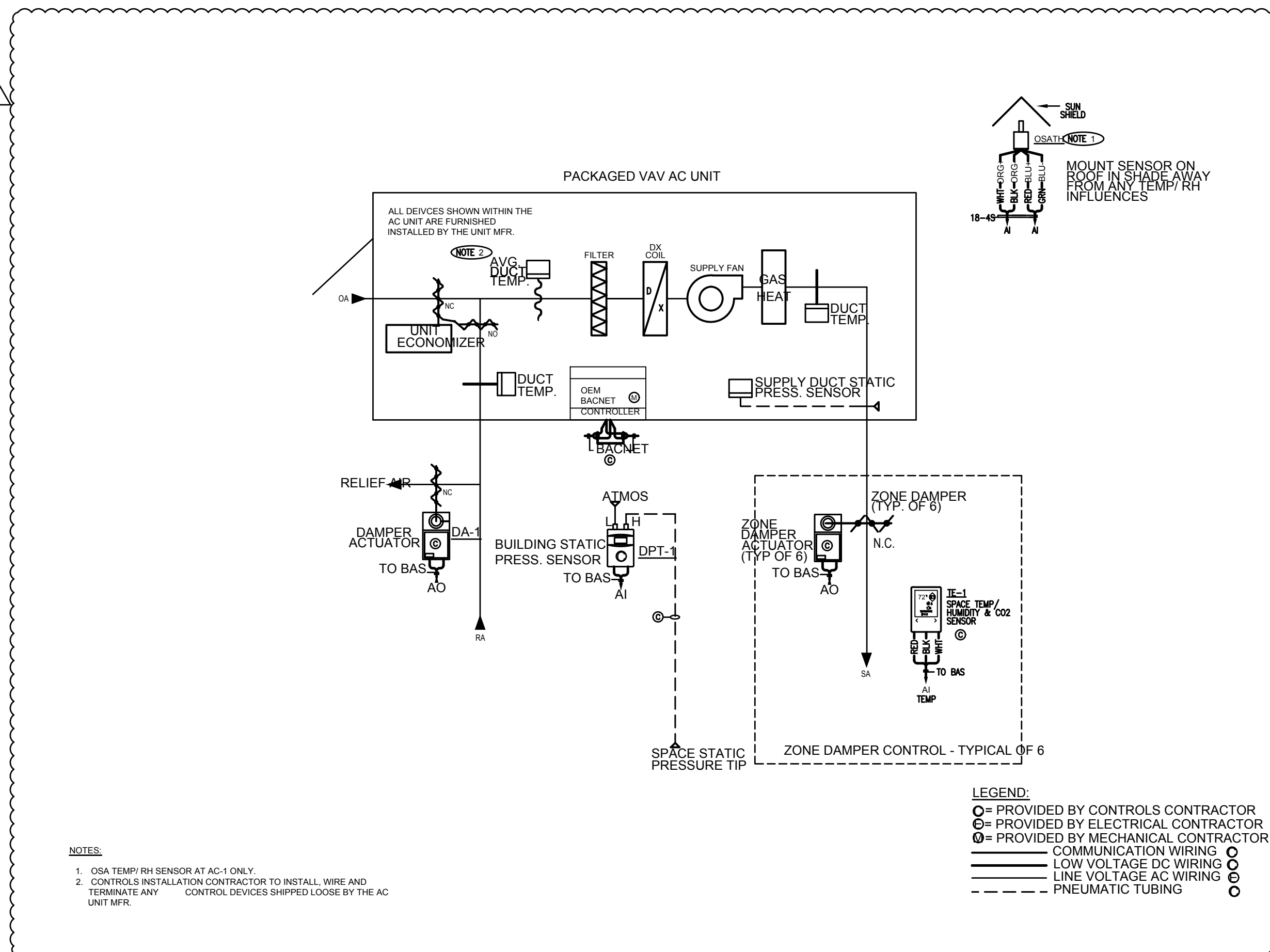
VAV A/C UNIT RELIEF DAMPER CONTROL:

THE DDC CONTROLLER SHALL CONTINUOUSLY MONITOR BUILDING PRESSURE (VIA PRESSURE SENSOR DPT-1) AND SHALL MODULATE THE RELIEF DAMPER (DA-1) OPEN UPON A RISE IN BUILDING PRESSURE ABOVE SETPOINT OF 0.03"WC (ADJ.).

CONTROLS SEQUENCE OF OPERATIONS



BAS NETWORK COMMUNICATION RISER DIAGRAM



MULTIZONE A/C UNIT AND ZONE CONTROL DIAGRAM

