ADDENDUM NO. 01
September 4, 2018

To Drawings and Specifications dated August 03, 2018.
DSA Application No.: 02-116660 - Approved August 14, 2018

MARENGO RANCH ELEMENTARY SCHOOL – HVAC REPLACEMENT
Galt Joint Union Elementary School District

Prepared by: **PBK**
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PBK Project Nos.: 17233

A. Receipt of this Addendum shall be acknowledged on the Bid Form.

B. This Addendum forms part of the Contract documents for the above referenced project and shall be incorporated integrally therewith.

C. Each bidder shall make necessary adjustments and submit this proposal with full knowledge of all modifications, clarifications, and supplemental data included therein. Where provisions of the following supplemental data differ from those of the original Contract Documents, this Addendum shall govern.

GENERAL INFORMATION

Item No. 1 The district would like to remove and replace four HVAC units concurrently with the Building Improvements project. All sheets are supplemental to the approved drawings and will not replace any of the approved drawing sheets. Addendum 01 shall serve as official notification of the adjustment of the Building Improvements project; based on approved drawings and specifications DSA App. No. 02-116660.

SPECIFICATIONS

Item No. 2 Addition of the attached Specification Sections:

22 05 00 – Common Work for Plumbing
22 05 23 – Valves and Accessories for Plumbing
22 11 23 – Natural Gas Piping
23 00 00 – HVAC General Conditions
23 05 00 – Common Work Results for HVAC
23 05 93 – Air and Water System Balancing
23 31 00 – Ductwork
23 33 00 – Air Duct Accessories
23 34 00 – Exhaust Fans
23 74 00 – Packaged Air Conditioning Units
26 28 16 – Overcurrent Protective Devices
26 28 19 – Disconnect Switches

DRAWINGS

Item No. 3 Addition of the attached Drawing Sheets:

SK-01 – Demolition Roof Plans – Bldgs A & G
SK-02 – Demolition Roof Plans – Bldgs C & E
SK-03 – Roof Plans – Bldgs A & G
SK-04 – Roof Plans – Bldgs C & E

SK-S1 – Bldg A, C, E, & G Roof Framing Plan
SK-S2 – Details
SK-M1 – HVAC Schedules
SK-M2 – HVAC Roof Plans Bldg A
SK-M3 – HVAC Roof Plans Bldg E
SK-M4 – HVAC Roof Plans Bldg G
SK-M5 – HVAC Roof Plans Bldg C
SK-M6 – Details
SK-M7 – Details
SK-E1 – Symbols List & Drawing Index
SK-E2 – Power Roof Plans
SK-E3 – Power Roof Plans

END OF ADDENDUM NO. 01

SECTION 22 05 00 – COMMONG WORK FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This section includes general mechanical materials and methods required within the project. Items included within this specification section include:
   1. Piping Supports
   2. Roof Flashing
   3. Dielectric Unions
   4. Pipe and Equipment Identification
   5. Fireproofing
   6. Painting
   7. Commissioning and preliminary operational tests

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of plumbing piping systems products, of types, materials, and sizes required whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with piping systems work similar to that required of project.

1.3 SUBMITTALS:

A. Product data: submit complete data of materials proposed including:
   1. Manufacturer and model number
   2. Clearly indicate all options, trim, and accessories.
   3. Cross reference manufacturer's cut sheet to specification section on submittal sheet.

B. Operation and Maintenance Data: where applicable, submit complete O&M data including:
   1. Maintenance data and parts lists for each component.
   2. Provide "trouble- shooting" maintenance guide
   3. Include this data within maintenance manual

PART 2 PRODUCTS

2.1 PIPING SUPPORTS:

A. All mechanical equipment supports shall be designed by a licensed Structural Engineer and shall comply with the 2013 California Building Code, Section 1616A.1.18 through 1616A.1.26 and ASCE 7-10, chapters 13, 16, and 30.

B. Mechanical equipment supports shall be designed by a licensed Structural Engineer.

C. Provide seismic sway bracing for all suspended piping and ductwork in accordance with the Seismic Restraint System Guidelines, OPM-0052-13 by Cooper B-Line / Tolco or equivalent OPM-0043-13 by Mason.

D. Provide all piping and ductwork with seismic restraints using seismic hazard level (SHL) "A" as called for in SMACNA's Seismic Restraint Manual Second Edition 1998.

E. Acceptable Manufacturer:

1. B-Line
2. Mason
3. Or Equal

2.2 ROOF FLASHING:

A. Flashings in metal deck or membrane type roofing:
   1. Flashing for penetrations of the roof for mechanical items such as flues, ducts, and pipes will be furnished and installed under other sections of these specifications. The work of this section shall include layout, sizing, and coordination of penetrations required for the mechanical work.
   2. Furnish and install counterflashings above each flashing required in the mechanical work. Flues and ducts shall have 24-gauge galvanized sheet metal storm collar securely clamped to the flue or duct above the flashing.
   3. Sewer vents and other piping extending through roof structure shall have flashing provided and installed as part of the roofing work. This contractor shall coordinate his Work accordingly.

B. Flashing in built-up roofing assemblies:
   1. Where flashing is not provided and installed as part of other Work, furnish and install a waterproof flashing and counterflashing for pipe, duct, and flue passing through roof. The flashing shall extend a minimum of 9 inches in all directions from the outside of the pipe, flue, or duct.
   2. Sewer vents and other piping extending through roof structure shall have four-pound sheet lead flashings and Semco, Smith, or equal to Semco #1100-4, counterflashing sleeves installed as detailed.
      a. Provide Hydroseal at underside of counterflashings as recommended in Semco installation instructions.
   3. Flues shall have 24-gauge galvanized steel flashings on all roofs. Securely clamp a storm collar (counterflashing) around the flue above the flashing. Storm collars shall be of same material as flashing.
   4. Seal all pipes, flues, or ducts passing through exterior walls in an approved, watertight manner.

2.3 DIELECTRIC UNIONS:

A. Furnish and install dielectric unions at all locations described herein, whether shown on Drawings or not, and except as noted herein. Construct couplings and flanges so that the two pipes being connected are completely insulated from each other with no metal-to-metal contact. Heavily line the couplings with a hard, insulating, phenolic plastic threaded in standard pipe sizes. Make up the flanges with insulating components consisting of a hard, phenolic gasket, bolt sleeves, and bolt washers. Supplement the insulating gasket with neoprene faces to form a seal.

B. Acceptable Manufacturers:
   1. Watts Regulator Co.
   2. Eclipse, Inc.
   3. Perfection Corp.

2.4 PIPING AND EQUIPMENT IDENTIFICATION:

A. Pipe Identification:

   1. Each piping system furnished and installed under this work shall be identified and the direction of flow indicated by a prefabricated coiled plastic colored label.

2. Labels shall comply with ASME A13.1 with regard to color, letter height, and marker size. The labels shall have black or white lettering and flow arrows on colored backgrounds and shall not require adhesive. The background colors shall conform to the color schedule shown in this Article.

3. For use outdoors use Polyester/Tedlar laminated material, MSI model MS-977, or equal. For piping with OD greater than 6" provide the label manufacturers stainless steel straps to secure label to piping.

4. The size of the lettering and label shall be such that the lettering can be easily read from the floor and the colors easily discernible.

5. Acceptable Manufacturers:
   a. Marking Services Incorporated (MSI)
   b. Idento Metal Products Co., Idento Bands
   c. Setmark

2.5 FIREPROOFING

A. Fireproofing to be installed at all pipe and duct penetrations of rated assemblies.

B. Fireproofing to be UL Rated fire stop material.

C. Acceptable Manufacturers:
   1. Hilti
   2. 3M Pro-Set
   3. Or Equal

PART 3 EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS:

A. Fasten all piping securely to structure with hangers, supports, guides, anchors, or sway braces to maintain pipe alignment, to prevent any sagging, and to prevent noise or excessive strain on the piping due to uncontrolled movement under operating conditions. Relocate hangers as necessary to correct unsatisfactory conditions that may become evident when system is put into operation.

B. Follow drawing requirements and details where special pipe support requirements are detailed on the Drawings.

C. Do not support piping by perforated tape, wire, rope, wood, nails, or other makeshift devices.

D. Design hangers and supports to support the weight of the pipe, weight of fluid, and weight of the pipe insulation with a minimum factor of safety of five based on the ultimate tensile strength of the material used.

E. Burning or welding on any structural member under load shall not be attempted. Field welding not called for on the Drawings or reviewed shop Drawings may only be done with consent and advice of the Architect and after proper provisions have been made to relieve the stress on the member. The boring of holes in beam flanges or narrow members will not be allowed.

F. Install hanger on insulated piping in a manner which will not produce damage to insulation. Provide steel pipe saddles as required to protect pipe covering. Install pipe hangers on

piping covered with insulation on the outside of the insulation and not in contact with the pipe.

G. Fasten hanger rods to concrete structural members with concrete inserts set flush with surface. Install a reinforcing rod through the opening provided in the concrete inserts. Fasten hanger rods to structural members with suitable beam clamps, and provide beam clips to lock clamp securely to beam.

H. Use of powder-actuated fasteners will not be permitted for the support of any overhead piping.

I. Turnbuckles, if used, shall have a load-carrying capacity at least equal to that of the pipe hanger with which they are being used.

J. All threaded parts of pipe hanger assemblies shall have full length of thread in service while in use.

K. Hanger material shall be reviewed by the Architect before installation.

L. Pipe Hanger or Support Spacing:
1. Provide pipe hangers or supports at 6-foot maximum spacing on steel pipe 3/4-inch diameter and smaller and for copper pipe 1-1/2 inches and smaller.
2. Support steel piping 1" and larger and copper larger than 1-1/2 inches at 10-foot maximum spacing.
3. Support steel piping used for gas at the following lengths:
   a. 1/2-inch diameter at 6-feet maximum
   b. 3/4-inch and 1-inch at 8-feet maximum
   c. 1-1/4-inch and larger at 10-feet maximum spacing

M. Provide hangers or supports for horizontal and vertical cast-iron drainage pipe at every other joint, except that when the developed length between hangers or supports exceeds 4 feet, provide hangers or supports at each joint. Provide adequate sway bracing to prevent shear.

3.2 ROOF FLASHING:

A. Provide pipe flashings as noted on the Drawings.

B. Flue and duct flashings and storm collars shall be securely clamped around flue or duct storm collar or counterflashing, above flashing.

3.3 DIELECTRIC UNIONS:

A. Install dielectric unions in the following locations:
1. In all metallic water and gas service connections into the building within 5 feet of the building wall. Install adjacent to the shut-off valve or cock and above ground where possible.
2. At points of connections where copper water lines connect to steel domestic water heater tanks and other equipment.
3. At points in piping where dissimilar metal pipes are connected together.
4. Any special applications shown on the Drawings.
5. Where steel or cast-iron pipe in the ground connects to copper or brass piping above the ground, the transition from steel or cast- iron pipe to the copper or brass pipe shall be made above ground in all cases and in an accessible location where practicable.
6. Where copper or brass piping is connected to steel or cast-iron piping and the connection is buried in the ground, the connection shall be covered with coal tar protective tape extending outward a minimum of 5 feet on all pipes, from the point of

connection. The tape shall have a minimum thickness of 10 mils and a maximum thickness of 12 mils and shall be applied so as to provide at least two full thicknesses of the tape over the piping. A primer, specifically designed for use with the tape, shall be used. The piping shall be thoroughly cleaned before any tape or primer is applied.

3.4 PIPE AND EQUIPMENT IDENTIFICATION:

A. Identification shall be applied to all piping, except piping located in furred spaces without access to permit entrance of personnel, and piping buried in the ground or concrete.

B. Underground pipe identification shall consist of a buried, continuous, preprinted, bright colored, plastic ribbon cable marker provided for each underground pipe.

C. The legend and flow arrow shall be applied at the following locations:
   1. All valve locations,
   2. All points where piping enters or leaves a wall, partition, cluster of piping, or similar obstruction
   3. All exposed locations
   4. At approximately 20-foot intervals on pipe runs.

D. Practical variations or changes in locations and spacing may be made with the specific approval of the Architect to meet specific conditions.

E. Wherever two or more pipes run parallel, the printed legend and other markings shall be applied in the same relative location so that all piping is easily identified.

F. The marking shall be located so as to be readily conspicuous at all times from any reasonable point of vantage.

G. Lettering size and label colors are to be per ASME/ANSI A13.1 Pipe Marking Standards.

3.5 FIREPROOFING:

A. Pack the annular space between the pipe sleeves and the pipe and between duct openings and ducts through all floors and walls with UL listed fire stop.

B. Fireproofing system to be installed in strict accordance with manufacturer's written instructions and details.

3.6 PAINTING:

A. Perform all priming and painting on the equipment and materials as specified herein.

B. Exposed piping and unfinished portions of equipment to be painted shall be cleaned of grease, oil, rust, or dirt in preparation for painting.

C. Where applicable, remove pipe clamps prior to painting so that entire pipe is painted. Provide temporary support as required. Re-install clamps after priming/painting is complete.

D. Priming:
   1. Contractor to prime all exposed ferrous metals, including piping, which are not galvanized or factory-finished.
      a. Black steel pipe exposed to weather shall be cleaned and primed with one coat of Rust-Oleum, or equal, #1069 primer prior to painting. Color to be Grey.

E. See Painting Section for detailed requirements.

3.7 DEMOLITION

A. Refer to Division 1 sections for general demolition requirements and procedures.

B. Disconnect, dismantle, and remove plumbing systems, equipment, and components indicated to be removed. Coordinate with all other trades
   1. Piping to be removed: Remove portion of piping indicated to be removed. Cap or plug remaining piping with same or compatible piping material.
   2. Piping to be abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material.
   3. Equipment to be removed: Drain down and cap remaining services and remove equipment.
   4. Equipment to be removed and re-installed: Disconnect and cap services and remove, clean, and store equipment. When appropriate, re-install, reconnect, and make equipment operational.
      a. If existing equipment which is to be re-installed is damage, contact architect prior to removal. Contractor to take pictures of any damaged equipment prior to its removal and submit pictures to Architect.
      b. Equipment damaged during removal, storage, or re-installation shall be the Contractor's responsibility and is to be replaced with new at no additional cost to the owner.
   5. Equipment to be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, removed damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.8 CARE AND CLEANING:

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

B. Drain and flush piping to remove grease and foreign matter. Thoroughly clean out flush valves, traps, strainers, and pressure-reducing valves.

C. Clean out and remove surplus materials and debris resulting from the work, including surplus excavated material.

3.9 OPERATION TEST:

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.10 CLEANING UP:

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 05 00

SECTION 22 05 23 - VALVES AND ACCESSORIES FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This section includes plumbing accessories including the following:
   1. Valves
   2. Miscellaneous piping products

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of plumbing piping systems products, of types, materials, and sizes required whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with piping systems work similar to that required of project.

C. Requirements of Regulatory Agencies: Contractor to conform to the publications listed below. Requirements of these publications are to be considered as a minimum standard. If details and specifications which require more stringent work are indicated within project, Contractor to provide the more stringent.
   1. California Plumbing Code (CPC) Compliance: Comply with applicable portions of the California Plumbing Code pertaining to selection and installation of plumbing materials and products. Fabricate and install natural gas systems in accordance with CPC.
   2. ANSI Compliance: Fabricate and install natural gas piping in accordance with ANSI B21.2, *Fuel Gas Piping*.
   3. NFPA Compliance: Fabricate and install natural gas systems in accordance with latest edition of NFPA 54, *National Fuel Gas Code*.
   4. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.
   5. ASME B31.9 for building services piping valves.
   6. NSF Compliance: NSF 61 for valve materials for potable-water service

D. All plumbing components intended to dispense water for human consumption shall comply with requirements of California Assembly Bill AB1953. Components to include (but not limited to): piping, faucets, angle stops, valves, bubblers, drinking fountains, piping, etc.

1.3 SUBMITTALS

A. Product data: submit complete data of materials proposed including:
   1. Manufacturer and model number
   2. Clearly indicate all options, trim, and accessories.
   3. Cross reference manufacturer's cut sheet to fixture callout ID on submittal sheet.

B. Operation and Maintenance Data: submit complete O&M data including:
   1. Maintenance data and parts lists for each component.
   2. Provide "trouble- shooting" maintenance guide
   3. Include this data within maintenance manual

PART 2 PRODUCTS

2.1 VALVES

A. General:
1. Similar valves to be by the same manufacturer.
2. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
3. Bronze Valves: 2”Øand smaller with threaded ends, unless otherwise indicated.
4. Ferrous Valves: 2 ½” Ø and larger with flanged ends, unless otherwise indicated.
5. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
6. Valve Sizes: Same as upstream piping unless otherwise indicated.
7. Valve Actuator Types:
   a. Handwheel: For valves other than quarter-turn types.
8. Valve-End Connections:
   a. Valve solder-joint connections are common in smaller sizes of plumbing piping. Soldering and brazing methods used to achieve required pressure-temperature ratings may damage internal valve parts. Special installation requirements for soldered valves may make threaded valves more cost-effective.
   b. Threaded: With threads according to ASME B1.20.1.

B. Acceptable Manufacturers:

1. Ball, gate, butterfly, and check valves:
   a. Nibco
   b. Appollo
   c. Milwaukee
   d. Hammond

C. Lever handle Gas Cock:
1. Gas Ball valve, with lever handle
2. Valve to be rated for 250 psi compressed gas.
3. UL Listed for gas and oil
4. CSA listed
5. Nibco, Model T-FP-600A or equal
   a. CWP Rating: 600 psig for 1/4” – 2”, 400 PSI for 2-1/2” - 4”
   b. Body: Forged Brass ASTM B283
   c. Ball: Chrome Plated Brass
   d. Ball Seat: PTFE
   e. Stem: Brass

PART 3 EXECUTION

3.1 INSTALLATION OF VALVES:

A. Valve Applications:

1. Natural Gas
   a. At connection to equipment: Lever handle Gas Cock

B. General:
1. Install valves with stems upright or horizontal. Valves stem position to be arranged to allow access for maintenance.

2. Do not install swing check valves in vertical position.
3. Provide gas cocks for gas service.
4. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
5. Operate valves in positions from fully open to fully closed prior to installing within system.
6. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
7. Locate valves for easy access and provide separate support where necessary.
8. Install valves in horizontal piping with stem at or above center of pipe.
9. Install valves in position to allow full stem movement.
10. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
11. Provide union at each connection to equipment and downstream of each valve. Provide unions at both ends of valves when valves can not be turned due to an obstruction.
12. Install seismic gas valve downstream of gas meter.
13. After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.
14. Tag each valve and provide a complete listing of valve locations and functions.

3.2 CARE AND CLEANING:

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work.

B. At completion of work, carefully clean and adjust equipment and trim installed as part of this work.

C. Leave systems and equipment in satisfactory operating condition.

3.3 OPERATION TEST:

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

END OF SECTION 22 05 23

SECTION 22 11 23 – NATURAL GAS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. This section includes piping and supports as required for the natural gas piping.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of plumbing piping systems products, of types, materials, and sizes required whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with piping systems work similar to that required of project.

C. Requirements of Regulatory Agencies: Contractor to conform to the publications listed below. Requirements of these publications are to be considered as a minimum standard. If details and specifications which require more stringent work are indicated within project, Contractor to provide the more stringent.
   1. California Plumbing Code (CPC) Compliance: Comply with applicable portions of the California Plumbing Code pertaining to selection and installation of plumbing materials and products. Fabricate and install natural gas systems in accordance with CPC.
   2. ANSI Compliance: Fabricate and install natural gas piping in accordance with ANSI B21.2, *Fuel Gas Piping*.
   3. NFPA Compliance: Fabricate and install natural gas systems in accordance with latest edition of NFPA 54, *National Fuel Gas Code*.
   4. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

D. Welding materials and labor shall comply with ASME Code and applicable state labor regulations.

E. Welders shall be fully qualified and certified b a state approved welding bureau for the types of welds required for the project.
   1. Each welder shall identify their work with a marking stamped on each weld joint of pipe, valve, or fitting.

F. Supports to be in accordance with SMACNA's Seismic Restraint Manual Second Edition 1998.

G. All plumbing components intended to dispense water for human consumption shall comply with requirements of California Assembly Bill AB1953. Components to include (but not limited to): piping, faucets, angle stops, valves, bubblers, drinking fountains, piping, etc.

1.3 SUBMITTALS

A. Submit manufacturer's catalog cut sheets, specifications, installation instructions, and dimensioned drawings for each type of pipe, support, anchor, and seal indicated within this section that is applicable to the project. Clearly indicate item being submitted.
   1. Indicate pipe schedules, pressure classes, etc.
   2. Indicate all options being submitted.

B. Provide Welding and Brazing Certifications. Submit reports as required for piping work applicable to the project.

1. Welders that do not have current Certifications shall not be permitted to weld and/or braze on the project.

PART 2 GENERAL

2.1 GENERAL:

A. Provide piping materials and factory fabricated piping products of sizes, types, pressure and temperature ratings, and capacities as indicated. Materials and products to comply with the California Plumbing Code.

B. Where more than one type of material is indicated, selection is the Contractors option.
1. Contractor to provide submittal information on material which is to be installed.
2. Where more than one material is indicated, the Contractor shall only install one material per system and materials shall not be mixed within the same system.

C. Malleable Iron Threaded Fittings: ANSI B16.3; plain or galvanized to suit piping. For use above grade only, except where indicated otherwise.

D. Malleable-Iron Threaded Unions: ANSI B16.39; selected by Contractor for proper piping fabrication and service requirements, including style, end connections, and metal-to- metal seats (iron, bronze, or brass); plain or galvanized as indicated.

E. Forged-Steel Socket Welding and Threaded Fittings: ANSI B16.11, except MSS SP-79 for threaded reducer inserts; rated to match schedule of connected pipe.

F. Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short-radius elbows and returns; rated to match connected pipe.

G. Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1-1/2 inches and where pipe size is less than 1-1/2 inches, and do not thread nipples full length (no close-nipples).

H. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Contractor to comply with installation requirements. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

I. Soldering Materials: Joints in copper tubing for all installations shall be made with brazing alloy sil-fos, or equal. Clean surfaces to be jointed shall be free of oil, grease, rust, and oxides.
1. Harris Stay-Safe 50 solder, or equal, may be permitted on plumbing lines above slab or ground only with prior review for piping sizes 2 inches and smaller only. Solders used shall contain no lead.

J. Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials.

K. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast- iron flanges; raised-face for steel flanges, unless otherwise indicated.

2.2 PIPING AND FITTINGS:

A. Natural Gas Piping:

1. Black Steel Pipe: ASTM A53, A106, or A120; except comply with ASTM A53 or A106 where close coiling or bending is required.
2. Pipe Size 2 inches and Smaller: Black steel pipe; Schedule 40; malleable-iron threaded fittings.
3. Pipe Size 2-1/2 inches and Larger: Black steel pipe; Schedule 40; wrought-steel buttwelding fittings.
4. All piping exposed to weather to be cleaned and painted.
    a. Paint entire gas pipe. Remove/re-install pipe clamps as may be required to paint entire pipe system.
        a. Black steel pipe exposed to weather shall be cleaned and primed with one coat of Rust-Oleum, or equal, #1069 primer prior to painting. Color to be Grey.
    b. Final coat to be outdoor rated paint, yellow color (or color as directed by owner).

PART 3 EXECUTION

3.1 GENERAL

A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.

B. Comply with ANSI B31 Code for Pressure Piping.

C. Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently leak-proof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes where indicated by use of reducing fittings. Align piping accurately at connections, within 1/16-inch misalignment tolerance.

D. Locate piping runs, unless detailed otherwise, vertically and horizontally (pitched to drain). Install piping parallel and perpendicular to adjacent building walls/structure and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations. Hold piping close to walls, overhead construction, columns, and other structural and permanent-enclosure elements of building; limit clearance to 1/2-inch where furring is shown for enclosure or concealment of piping; locate insulated piping for 1” clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view by locating in column enclosures, in hollow wall construction, or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.

E. Should structural difficulties or work of other contractors prevent the running of pipes or the setting of equipment at the points shown, Contractor to make the necessary deviations to the piping system, as determined by the Contractor, with the Architect's review, without additional cost to Owner.

F. Inspect each piece of pipe and each fitting to see that there is no defective workmanship on pipe or obstructions in pipes and fittings.

G. Installation Of Protective Pipe Wrap:

3.2 INSTALLATION OF NATURAL GAS PIPING:

A. Run piping generally level, free of unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work

B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

C. Connect gas piping to each gas-fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instructions.
   1. Appliance fuel connectors, as indicated in 1202 of the California Plumbing Code, are not acceptable for connection of equipment, except where specifically indicated on the Contract Documents.

D. Install exposed polished or enameled connections from fixtures or equipment with special care, showing no tool marks or threads at fittings.

E. Cap or plug openings in pipe and fittings immediately to exclude all dirt until fixtures are installed or final connections made.

F. Use reducing fittings where any change in pipe size occurs. Bushings shall not be used.

G. Couplings shall not be used except where required pipe runs between fittings are longer than a standard length of the type of pipe being used and except where their use is specifically reviewed by the Architect.

H. Conceal piping in finished portions of building, above the floor line, except where otherwise shown or noted. Cutting of walls and floors shall be held to the minimum possible to secure the proper installation.

I. Install piping subject to expansion or contraction in a manner permitting strains to be evenly distributed and alleviated by expansion loops installed as required.

J. Sleeves for branches through walls from adjacent mains shall be of sufficient size to allow for free side motion of covered pipe in sleeve.

K. Remove cutting and threading burrs before assembling piping.

L. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped, or damaged.

M. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.

N. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection. Provide listed isolation fitting above grade prior to entry into building. Provide independent ground systems for above ground and below grade.

O. Install drip-legs in gas piping where indicated and where required by code or regulation.

P. Install piping parallel to other piping and walls unless detailed otherwise.

Q. Contractor to use extreme care when working with galvanized fittings as to not damage galvanized finish. If finish is damaged, contractor to paint damaged area with “Brite Zinc” paint by “Brite Products” or equal. Follow requirements as outlined in ASTM A780.

3.3 PIPING SYSTEM JOINTS:

A. General: Provide joints of type indicated in each piping system.

B. Cut all steel pipe and hard copper tubing by power hacksaw, a circular cutting machine using an abrasive wheel or in square end vise by means of hand hacksaw. Wheel cutters may be used for steel pipe provided that pipe shall have ends reamed to full inside diameter and beveled before being made up into fittings. Pipe shall have round edges or burrs removed so that a smooth and unobstructed flow will be obtained.

C. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, Rector- Seal #5, on male threads at each joint and tighten joint to leave not more than 3 threads exposed. Teflon tape may be used on piping smaller than 2 inches.

D. Weld pipe joints in accordance with recognized industry practice and as follows:
1. Welding shall be done by qualified welders in a first-class, workmanlike manner, conforming to the American Standard Code for Pressure Piping USA B-31-1 and B-31-1A.
2. Bevel pipe ends at a 37.5 degree angle where possible, smooth rough cuts, and clean to remove slag, metal particles, and dirt.
3. Do not weld-out piping system imperfections by tack-welding procedures; re-fabricate to comply with requirements.

3.4 TEST OF PIPING:

A. Test piping at completion of roughing in, in accordance with the following schedule. Show no loss in pressure or visible leaks after a minimum duration of 4 hours at the test pressures indicated. Tests to be verified by Inspector of Record.

SYSTEM TESTED	TEST PRESSURE PSIG	TEST WITH
Steel Gas Piping	100 lbs.	Air

B. Testing equipment, materials, and labor shall be furnished by this Contractor.

C. Repair piping systems sections which fail required piping test, by disassembly and reinstallation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

D. Drain test water from piping systems after testing and repair work has been completed.

3.5 CLEANING UP:

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 11 23

SECTION 22 00 00 – HVAC GENERAL CONDITIONS

PART 1 GENERAL

1.1 GENERAL:

A. This Section specifies the Division 23 Work coordination requirements with general work provisions.

B. For convenience and reference the Division 23 Specifications are separated into Divisions and Sections. Such separations shall not operate to make the Engineer an arbitrator to establish subcontract limits between the Prime Contractor and his Subcontractors. In any case, the Prime Contractor is responsible to the owner for a complete job.

C. This section consists of General Requirements and Standard Specifications covering certain parts of work under Division 23 and is supplemented by other Division 23 sections covering additional work, requirements, and materials specifically applicable to the work of each section.
   1. Requirements of subsequent sections of the specifications, if in conflict with these General Requirements, shall govern.

D. No material installed as part of this WORK shall contain asbestos in any form.

1.2 CONDITIONS OF THE CONTRACT

A. The Conditions of the Contract (General, Supplementary, and other Conditions) and the General Requirements (Sections of Division 1) are hereby made a part of this Section.

B. This section is a Division-23 Basic Materials and Methods section and is a part of each Division -23 section.

1.3 DESCRIPTION OF REQUIREMENTS

A. Provide finished work, tested and ready for operation including apparatus, appliances, materials, and work. Provide incidental accessories necessary to make the work complete and ready for operation without additional expense to the Owner.

B. Before beginning work or ordering materials, consult Architect for clarification of discrepancies between, or questionable intent, of the Contract Documents.

C. Contractor shall visit the site and field survey the existing site conditions prior to bid. Any site conditions which may cause significant deviation from the design drawings shall be brought to the attention of the Owner's representative for clarification prior to bid.

1.4 REQUIREMENTS OF REGULATORY AGENCIES:

A. Provide work and materials in full accordance with the latest rules and regulations of the following:
   1. California Code of Regulations - Title 24 - Parts 2, 3, 4,5, and 9
   2. California Code of Regulations - Title 22 - Chapter 7
   3. California Building Code, 2016
   4. California Mechanical Code, 2016
   5. California Plumbing Code, 2016
   6. California Electric Code, 2016
   7. California Fire Code, 2016
   8. California Building Energy Efficiency Standards 2016

9. California Green Building Standards 2016
10. California Energy Code 2016
11. National Fire Protection Association
12. CAL-OSHA
13. Occupational Safety and Health Administration
14. State Fire Marshal, Title 19 CCR
15. Other applicable state laws

B. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes.

C. Conform to State of California Energy Conservation Standards for all systems, equipment, and construction.

D. The above Codes and Standards define minimum requirements required for the project. Where Contract Documents differ from governing codes, furnish and install higher standard.

1.5 FEES, PERMITS, AND UTILITY SERVICES:

A. Arrange for required inspections and permits required in installation of the work.

B. The Owner will pay charges for permits required.

1.6 SITE EXAMINATION:

A. Examine site, verify dimensions and locations against Drawings, and inform self of conditions under which work is to be done before submitting proposal. No allowance will be made for extra expense on account of error.

B. Information shown relative to existing services is based upon available records and data but is approximate only. Make minor deviations found necessary to conform with actual locations and conditions without extra cost. Verify location and elevation of utilities prior to commencement of excavation for new piping or its installation.

C. Exercise care in excavating near existing utilities to avoid any damage thereto. This Contractor is responsible for any damage caused by his operations.

1.7 MATERIAL LIST AND SUBSTITUTIONS:

A. Prior to commencement of work, and within 10 days after award of Contract, submit to Architect for review electronic copies of a complete list of equipment and materials to be furnished, including all substitutions. All submittals to be in electronic format as follows:
1. Submittals to be in PDF Format.
2. Individual PDF cut sheets shall be inserted into a single file for review.
3. All sheets to be “unprotected” and writable.

B. Provide submittal information for all materials proposed for use as part of this project. Provide standard items on specified equipment at no extra cost to the contract regardless of disposition of submittal data. Other material or methods shall not be used unless approved in writing by the Architect. The Architect’s review will be required even though “or equal” or synonymous terms are used.

C. It is the responsibility of the Contractor to assume all costs incurred because of additional work and/or changes required to incorporate the proposed substitute into the project including possible extra compensation due to the Architect. Refer to Division 1 for complete instructions.

D. Contractor to provide complete Submittal packages for each system. At a maximum, submittals to be broken into the following packages:
   1. Mechanical – Dry Side package including: Ductwork, Accessories, etc.
   2. Mechanical – AC Units and adaptor roof curbs.
   3. Mechanical – Exhaust Fans
   4. Mechanical – Building Automation System

E. Identify each item by manufacturer, brand, trade name, model number, size, rating, or whatever other data is necessary to properly identify and review materials and equipment.
   1. Where submittal sheets indicate more than one product, Contractor to clearly identify product being submitted. Contractor to cross-out information not being submitted for review.
   2. Submittals that do not clearly identify submitted item will be returned to the Contractor un-reviewed.

F. Identity each submitted item by reference to specification section number and paragraph in which item is specified. Cross reference submittals by equipment ID where applicable.

G. Quantities are the Contractor's responsibility and will not be reviewed.

H. If Contractor desires to make a substitution, he shall submit complete information or catalog data to show equality of equipment or material offered to that specified.
   1. Only one request for substitution will be considered on each item of material or equipment. No substitutions will be considered thereafter.
   2. Scheduled Products and first named manufacturer/product forms basis of design. All other manufacturers' products are substitutions.
   3. No substitutions will be allowed unless requested and reviewed in writing.
   4. The Architect shall review and take appropriate action on shop Drawings, product data, samples, and other submittals required by the Contract Documents. Such review shall be only for general conformance with the design concept and general compliance with the information given in the Contract Documents. It shall not include review of quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with the work of other trades, or construction safety precautions, all of which are the sole responsibility of the Contractor.
   5. Review of a specific item shall not indicate acceptance of an assembly of which the item is a component. The Architect shall not be required to review and shall not be responsible for any deviations from the Contract Documents not clearly noted by the Contractor, nor shall the Architect be required to review partial submissions or those for which submissions for correlated items have not been received. Architect reserves right to require originally specified item.

I. Installation of reviewed substitution is Contractor's responsibility. Any changes required for installation of reviewed substituted equipment must be made without additional cost to the owner. Review by the Architect of the substituted equipment and/or dimensional Drawings do not waive these requirements.

1.8 MAINTENANCE AND OPERATING INSTRUCTIONS:

A. Instruct the Owners' authorized representatives in the operation, adjustment, and maintenance of all mechanical equipment and systems. Provide 3 copies of certificate signed by Owner's representatives attesting to their having been instructed.

B. Furnish Architect with three complete sets of operating and maintenance (O&M) instructions.
   1. O&M manuals to be bound in hardboard binder and indexed.

2. O&M manuals to include: descriptive literature, catalog cuts, and diagrams covering all items of operation and maintenance for each and every mechanical system and piece of equipment furnished under these specifications.
3. Include in each set a copy of the air balance test report specified hereinafter.

C. Contractor must start compiling the above data (including obtaining operating and maintenance instruction data and catalog cuts and diagrams from the manufacturer of the reviewed equipment) immediately upon review of his list of materials, so as not to delay the final installation of the work.

D. Bind and index each set in a durable, hardboard binder. Final observation will not be made until booklets are submitted and have been reviewed by the Architect.

E. O&M manuals to incorporate the following:
1. Complete operating instructions for each item of heating, ventilating and air conditioning equipment and associated piping and ductwork systems.
2. Test data and system balancing reports as specified.
3. Temperature control diagrams and literature.
4. Manufacturer's bulletins with parts numbers, instructions, etc. for each item of equipment. Remove information not applicable to project.
5. Typewritten maintenance instructions for each item of equipment listing in detail the lubricants to be used, frequency of lubrications, inspections required, adjustment, etc.
6. A complete list and/or schedule of all major valves giving the valve ID, location of valve, and the rooms or area controlled by the valve.
7. Provide copies of start-up reports for each piece of mechanical equipment provided as part of this work.
8. Name, address, and phone number of contractors involved in work under this Division.
9. Detailed step-by-step instructions for starting, summer operation, winter operation, and shutdown of each system.
10. Detailed maintenance instructions for starting, summer operation, winter operation, and shutdown of each system.
11. Spare parts list.
12. Full size Record as built shop drawings in hard copies and in AutoCad 2004 CAD files.
    a. Contractor to incorporate field mark-ups into record drawings. Mark-up shop drawings not acceptable.

1.9 COORDINATION SHOP DRAWINGS

A. General:
1. Prepare and submit for review coordination drawings where work by separate entities requires fabrication of products and materials which must accurately interface or for which space provided is limited.
2. Coordination drawings shall indicate how the work will interface and installation will be sequenced. It is the intent of this provision to find, bring forth, and resolve potential constructability problems prior to actual construction, thereby allowing for the resolution of issues before construction cost and schedule are impacted.

B. The General Contractor shall oversee preparation of coordination drawings, assign priority space, and bring to the attention of the Architect any conflicts or interferences of an unresolved nature found during preparation of coordination drawings. Expedite conflict or interferences and submit solutions/ recommendations for approval review.

C. Drawings: Shop drawings shall include but are not necessarily limited to the following:

1. Submit 1/4" = 1'-0" minimum scale, a combined, comprehensive mechanical coordination drawing. Coordination drawing shall include all ductwork, mechanical piping, plumbing, sprinkler systems, and ceiling systems overlaid on structural frame and architectural plan. Shop drawings are to be coordinated with all electrical and Telecom systems.
2. Criteria: Ductwork, mechanical piping, plumbing, and sprinkler system components shall be sized as shown on Drawings. Seismic restraints shall be shown where required. Nonconforming Mechanical work installed within designated coordination areas is subject to removal and replacement by the installing contractor at no additional cost to Owner.
3. Provide sections for congested areas.
4. Identify typical areas, start preparation of coordination drawings for such areas first.

D. Where required for coordination purposes, Contractor to modify duct shape to an equivalent flattened size at no additional cost to the owner. Contractor to limit duct aspect ratio to 3:1 unless provided special written permission by the Architect.

E. Coordination drawings shall be signed and dated by individual trade contractors. By act of signature and submittal of singular combined coordination drawing, each trade contractor acknowledges their coordinated portion of the work with all other mechanical, electrical, telecom, architectural, and structural work contractors.

F. After completion of coordination shop drawings signed by individual trade contractors. Submit copies to the architect for review. Once approved, provide copy at the job site for reference. No work shall be performed without the complete coordination shop drawings.

G. No request for information regarding the routing of pipes, ductwork and placement of equipment will be reviewed and responded to without a completed shop drawings.

1.10 SITE CONDITIONS

A. Information of the drawings relative to existing conditions is approximate only. Deviations found necessary during progress of construction to conform to actual conditions as approved by the Architect shall be made without additional cost to the Owner. The Contractor shall be held responsible for any damage caused to existing services. Promptly notify the Architect if services are found which are not shown on the Drawings.

PART 2 PRODUCTS

2.1 GENERAL:

A. Mention herein or on Drawings requires that this Contractor provide each item listed of quality noted or equal. Refer to subsequence division 23000 specification sections for specific equipment and system materials and accessories.

B. All material shall be new, full weight, standard in all respects, and in first- class condition.

C. Provide materials of the same brand or manufacture throughout for each class of material or equipment wherever possible.

D. The grade or quality of materials desired is indicated by the trade names or catalog numbers stated herein.

E. Dimensions, sizes, and capacities shown are a minimum and shall not be changed without permission of the Architect.

F. Conform to the State Energy Conservation Standards for all material and equipment.

2.2 MATERIALS FURNISHED:

A. Identify all materials and equipment by manufacturer's name and model number. Remove unidentified materials and equipment from site.

B. Equipment specified by manufacturer's number shall include all accessories, controls, etc. listed in catalog as standard with equipment. Furnish optional or additional accessories as specified.

C. Equipment or material damaged during transportation, installation, or operation is considered as totally damaged. Replace with new equipment. Variance from this permitted only with written consent of the Architect.

D. Deliver, Protection, and Care:
1. Deliver materials or equipment to the Project in the manufacturer's original, unopened, labeled containers.
2. Added costs associated with reordering, expediting orders, or project delays due to rejected materials shall be borne by the Contractor.
3. Protect from damage which may be caused by theft, weather, and building operations. Failure to protect materials and apparatus adequately shall be sufficient cause for rejection of any damaged material or equipment.
4. Close pipe and equipment openings to prevent intrusion of obstructions and damage.
5. Owner or Architect will require removal and replacement of such material or work from the premises which is not in accordance with Contract Documents. Replace unsatisfactory work without delay, at no additional cost to the Owner.
6. All material and equipment shall be protected against moisture, dirt and damage. Protective coverings shall be provided for bearings, open connections to pumps and tanks, coils, ducts, pipes and similar equipment that is vulnerable to grit and dirt.
7. The interior of the pipes and ducts shall be kept clean at all times.

PART 3 EXECUTION

3.1 GENERAL:

A. General arrangement and location of piping, ductwork, equipment, etc. are shown on Drawings or herein specified. Carefully examine other work that may conflict with this work. Install this work in harmony with other crafts and at proper time to avoid delay of work. Provide all offsets as required to avoid other trades at no additional cost to the owner.

B. In advance of construction, work out minor changes and relocations to suit actual conditions and work of other trades to avoid conflict therewith. This shall not be cause for additional cost.

C. Execute any work or apparatus shown on the Drawings and not mentioned in the specifications, or vice versa, the same as if specifically mentioned by both. Omission from Drawings or specifications of any minor details of construction, installation, materials, or essential specialties does not relieve this Contractor from furnishing same in place complete.

D. Furnish and install any incidental work not shown or specified which can reasonably be inferred as part of the work and necessary to provide a complete and workable system.
1. Minor piping associated with instrumentation and control is generally not shown. Interconnection of sensors, transducers, control devices, instrumentation panels,

combustion control panel, burner control panels is the responsibility of the contractor. Small piping associated with water cooling, drips, drains and other minor piping may not be shown to avoid confusion in the plan presentation but shall be provided as part of contract work. Drains shall be piped to the nearest floor drains.

E. Furnish materials and work at proper time to avoid delay of the work.

F. Coordinate with testing and balancing contractor to review drawings for proposed additional balancing components required for proper system testing and balancing.

3.2 ACCESS:

A. Continuously check Architectural Drawings for clearance and accessibility of equipment specified herein to be placed. No allowance of any kind will be made for negligence on part of Contractor to foresee means of installing his equipment into proper position.

3.3 CLOSING IN OF UNINSPECTED WORK:

A. Do not allow or cause work installed to be covered up or enclosed before it has been inspected and tested. Should work be enclosed or covered up before it has been inspected and tested, uncover work at own expense. After it has been inspected and tested, make repairs necessary to restore work of other contractors to condition in which it was found at time of cutting.

3.4 PROJECT MODIFICATIONS:

A. During the progress of construction, if such conditions arise that require revisions, modifications, or relocations to any mechanical equipment or materials incorporated in this project, such alterations shall be immediately called to the attention of the Architect. Contractor shall then prepare necessary Drawings showing proposed changes. Submit proposed changes for review by the Architect prior to actual revision work in the field.

B. Two sets of Drawings showing all revisions shall be immediately presented to Architect for his records. Maintain additional copies on the project as necessary to comply with "RECORD DRAWINGS" requirement of the General Requirements.

C. Incorporate all revisions into record Drawings.

3.5 FORMING, CUTTING AND PATCHING:

A. Coordinate with other contractors as necessary to provide any special forming, recesses, chases, etc., and provide wood blocking, backing, and grounds as necessary for proper installation of mechanical work.

B. If this Contractor fails to coordinate with other contractors at proper time or fails to locate items properly, resulting in extra work, then this Contractor is responsible.

C. This Contractor is responsible for proper placement of pipe sleeves, hangers, inserts, and supports for work.

D. Cutting, patching, and repairing of existing (old) construction to permit installation of piping, etc. is responsibility of this Contractor. Repair or replace damage to existing work with skilled mechanics for each trade involved in first-class manner.

E. Core openings through existing construction as required for the passage of new piping and conduits. Cut holes of the minimum diameter to suit size of pipe installed and associated insulation.

3.6 DEMOLITION AND SALVAGE:

A. Provide demolition of mechanical work under this SECTION as indicated on Drawings.

B. Prior to demolition, Contractor to work with owner to get list of equipment to be returned to owner. Removed materials which will not be re-used and which are not claimed by the owner shall become the property of the Contractor and shall be removed from the premises. Consult Owner before removing any material from the premises. Carefully remove materials claimed by the owner to prevent damage. Coordinated delivery of such items to owner.
   1. Contractor to deliver items claimed by owner to owner's off site facility. Exact delivery site to be coordinated with owner.

C. Removed materials which are to be reused are to be removed, cleaned, and stored in a safe location. If such items are lost or damaged by the Contractor, item shall be replaced with new item at no added cost to owner. If item is found to be damaged prior to removal, inform Architect prior to removal so that item may be examined by Architect and owner for further instructions.

3.7 WELDING FOR MECHANICAL WORK

A. All mechanical welding and inspection requirement shall be in accordance with the California Mechanical Code.

B. Qualify welding procedures, welders and operators shall be in accordance with ASME boiler and pressure vessel code, section IX, welding and brazing qualifications. Welding procedures and testing shall comply with ANSI standard B31.9 - standard code for pressure piping, and the American Welding Society (AWS) welding handbook.

C. Soldering and brazing procedures shall conform to ANSI B9.1 standard safety code and NFPA 99.

D. All welders shall be certified by a state approved welding bureau. Fabricator shall have current and valid certificated registration by the building official for the types of welds required by the project. Prior to start of the project, the fabricator shall submit a copy of certificate of registration for approval. Prior to project close out, the fabricator shall submit a certificate of compliance that the work was performed in accordance with the approved plans and specifications to the building official and to the Engineer or Architect of record.

3.8 EXISTING SERVICES:

A. Provide and install all required connections to existing systems as required by the Drawings and specifications.

B. Integrate existing systems with all new work to provide a complete working system.

C. Provide minimum 72 hour notice to Owner of service interruptions. All service interruptions shall be kept to the minimum possible time. When requested by Owner service interruptions shall occur outside of normal working hours at no additional cost to owner.

3.9 ASBESTOS ABATEMENT:

A. Existing systems within the area of this scope of work may have asbestos-bearing materials. Testing, encapsulation, removal, treatment, or correction of existing asbestos-bearing materials is not a part of this scope of work and is not the responsibility of the mechanical contractors.

3.10 STRUCTURAL DESIGN OF EQUIPMENT AND SEISMIC RESTRAINTS:

A. All mechanical equipment supports shall be designed by a licensed Structural Engineer and shall comply with the 2016 California Building Code, Section 1616A.1.18 through 1616A.1.26 and ASCE 7-10, Chapters 6 and 30.

B. Provide seismic sway bracing for all suspended piping and ductwork in accordance with the OSHPD anchorage pre-approval OPA-0349, the “Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, and Electrical Systems”.
   1. Badger, B-Line, Superstrut, or equal systems bearing current OPA numbers shall also be acceptable.

3.11 WARRANTY

A. Be responsible for work done and material installed under these plans and specifications. Repair or replace, as may be necessary, any defective work, material, or part which may show damage to itself or other materials, furnishing, equipment, or premises caused by such defects during this period, if in the opinion of the Architect said defect is due to imperfection of material or workmanship. Provide all such work and materials at no cost to Owner.

B. Be responsible for damage to any part of premises during guarantee period caused by leaks or breaks in work furnished and/or installed under this section. Replace refrigerant, lubricants, or gasses lost as result of defects, breaks, or leaks in work.

C. Provide manufacturer's written warranties covering defects in material and workmanship of products and equipment utilized for the project.

D. Warranties shall be for a period of 2 year from the date of substantial completion unless more stringently specified within individual Sections of this Division.

3.12 START-UP PROVISIONS FOR MECHANICAL WORK

A. General: Major equipment (such as air handling units, boilers, and chillers) start-up shall be performed by the equipment manufacturer or authorized representative.

B. Adjusting and Aligning Equipment: Adjust all equipment. Check all motors for proper rotation.

C. Lubrication:
   1. Extend grease fittings on bearings to points of ready and easy accessibility.
   2. Lubricate fan bearings, etc., before operation of any equipment.
   3. Provide a final lubrication to equipment immediately before turning over to Owner.

D. Upon completion of the mechanical work, or at such time prior to completion as may be determined by the Architect, operate and test all mechanical equipment and systems to demonstrate the satisfactory overall operation of the building or project as a complete unit. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install new air filters and lubricate all running

equipment. Notify the Architect at least seven calendar days in advance of starting the above tests. Test equipment and systems for a minimum as follows:

1. Packaged AC Units (under 20 tons), ductless split systems: 2 consecutive 8-hour days

E. Provide training and orientation of Owners operating staff in proper care and operation of equipment, systems and controls.

F. Neatly tabulate and deliver to the Architect complete operational data, including air flows, room temperatures, fan speeds, motor currents, plenum and duct static pressures, and other data as required. The Architect reserves the right to spot check results, and if discrepancies or errors are noted, Contractor will be required to redo balancing tests and tabulations entirely.

G. During test period, make final adjustments and balancing of equipment, systems, controls, and circuits so that all are placed in first-class operating condition.

H. Final observation will not be made until all of the above have been completed and a preliminary copy of the balance report has been submitted and reviewed.

3.13 POST-CONTRACT COMPLETION TESTS:

A. If the required full-load operation conditions cannot be obtained at the time of the Project Completion Tests due to outdoor seasonal temperatures, return to the job site when requested by the Architect and complete proper loading of equipment and systems as required. Changing of any air filters will not be required under these tests. Contractor will be allowed seven calendar days after notification to begin tests.

3.14 PRE-SEASON START UP:

A. When requested by the Owner within one year of the filing of Notice of Completion, and when full-load tests required under Project Completion Tests and Post Contract Completion Tests have not been performed, start up any equipment or systems required for heating or cooling season operation by the Owner when such equipment and systems have remained shut down immediately after the Project Completion Tests. Make proper assurance that all equipment and systems are operating properly before being turned over for the first operational use of the Owner within one year of filing of Notice of Completion. The changing of any air filters will not be required under these start-up requirements. The Contractor will be allowed seven calendar days after notification, to begin test.

3.15 MECHANICAL RECORD AS-BUILT DRAWINGS:

A. During the course of Project Construction, Mechanical Contractor shall maintain recorded “AS-built” information by distinctively marking up approved shop drawings prints to depict all actual work installed on a daily basis form but not limited to field conditions, addendums, architectural supplemental instructions (ASIs) , instruction bulletins (IBs), change orders (COs), responses to Request For Information (RFIs), and approved product substitutions.

B. The marked-up shop drawings will be made available at the Construction Site to the Architect upon request, at any time.

C. The marked up shop drawings with the recorded information shall then be used to create Record As-built drawings at the completion of the project. Contractor shall submit the Record As-built drawings in full size hard copies.

1. Hand marked shop drawings are not acceptable.
2. Provide 2 complete sets of full size drawings on 20 pound white bond paper.

3. Provide 1 CD (compact disc) with Record drawings.
4. Record as-built drawings are to be full size drawings (same size as Contract Documents) and all plans are to be to standard engineering scale. The minimum drawing scale to match those provided within the Contract Documents.

D. Record As-built drawings shall include the followings:

1. General:
   a. Work on Record As-built drawings shall be provided with horizontal and vertical dimensions. Underground work shall be provided with invert elevations. All dimensions shall be references to permanent building fixed points and/or column lines.
   b. Provide sufficient details and sections to depict actual installations.
   c. Equipment identifications and system labeling nomenclatures shall match the Project Design Documents.
   d. Identification of main shut-off valves shall be based on the approved valve tag list and as actually installed in field.

2. HVAC:
   a. Ductwork mains and branches, size and location with duct elevation information.
   b. Locations of all dampers, including but not limited to balancing dampers, fire dampers, combination fire and smoke, air inlets and outlets, terminal units reheat coils, humidifiers, duct access doors and ceiling access panels.
   c. Piping mains and branches, size and location with pipe elevation information and invert elevations for underground piping.
   d. Locations of all manual and automatic valves, pipe strainers, expansion joints and compensators, pipe guides and anchor points, steam traps and air vents.
   e. Equipment locations with dimensions from prominent building lines and required service access.
   f. Seismic bracing information for ductwork, piping and equipment.
   g. Locations of control system panels, control power transformer panels miscellaneous relay panels, control workstations, routing of control system communication loops.
   h. Locations of all installed instruction and control field devices in occupied space and above ceiling including but not limited to thermometers, pressure gauges, flow meters, airflow stations, temperature sensors, differential pressure sensors, thermostats and humidistats.

3.16 CLEANING UP:

A. Remove tools, scaffolding, surplus materials, barricades, temporary walks, debris, and rubbish from the Project promptly upon completion of the work of each Section. Leave the area of operations completely clean and free of these items.

END OF SECTION 23 00 00

SECTON 23 05 00 – COMMON WORK FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. This section includes general mechanical materials and methods required within the project. Items included within this specification section include:
   1. Roof Flashing
   2. Dielectric Unions
   3. Pipe and Equipment Identification
   4. Motors
   5. Motor Starter, Switches, And Wiring
   6. Fireproofing
   7. Painting
   8. Electrical Work
   9. Commissioning and preliminary operational tests

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of plumbing piping systems products, of types, materials, and sizes required whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with piping systems work similar to that required of project.

1.3 SUBMITTALS:

A. Product data: submit complete data of materials proposed including:
   1. Manufacturer and model number
   2. Clearly indicate all options, trim, and accessories.
   3. Cross reference manufacturer's cut sheet to specification section on submittal sheet.

B. Operation and Maintenance Data: where applicable, submit complete O&M data including:
   1. Maintenance data and parts lists for each component.
   2. Provide "trouble- shooting" maintenance guide
   3. Include this data within maintenance manual

PART 2 PRODUCTS

2.1 ROOF FLASHING:

A. Flashings in metal deck or membrane type roofing:
   1. Flashing for penetrations of the roof for mechanical items such as flues, ducts, and pipes will be furnished and installed under other sections of these specifications. The work of this section shall include layout, sizing, and coordination of penetrations required for the mechanical work.
   2. Furnish and install counterflashings above each flashing required in the mechanical work. Flues and ducts shall have 24-gauge galvanized sheet metal storm collar securely clamped to the flue or duct above the flashing.
   3. Sewer vents and other piping extending through roof structure shall have flashing provided and installed as part of the roofing work. This contractor shall coordinate his Work accordingly.

B. Flashing in built-up roofing assemblies:
   1. Where flashing is not provided and installed as part of other Work, furnish and install a waterproof flashing and counterflashing for pipe, duct, and flue passing through roof. The flashing shall extend a minimum of 9 inches in all directions from the outside of the pipe, flue, or duct.
   2. Sewer vents and other piping extending through roof structure shall have four-pound sheet lead flashings and Semco, Smith, or equal to Semco #1100-4, counterflashing sleeves installed as detailed.
      a. Provide Hydroseal at underside of counterflashings as recommended in Semco installation instructions.
   3. Flues shall have 24-gauge galvanized steel flashings on all roofs. Securely clamp a storm collar (counterflashing) around the flue above the flashing. Storm collars shall be of same material as flashing.
   4. Seal all pipes, flues, or ducts passing through exterior walls in an approved, watertight manner.

2.2 DIELECTRIC UNIONS:

A. Furnish and install dielectric unions at all locations described herein, whether shown on Drawings or not, and except as noted herein. Construct couplings and flanges so that the two pipes being connected are completely insulated from each other with no metal-to-metal contact. Heavily line the couplings with a hard, insulating, phenolic plastic threaded in standard pipe sizes. Make up the flanges with insulating components consisting of a hard, phenolic gasket, bolt sleeves, and bolt washers. Supplement the insulating gasket with neoprene faces to form a seal.

B. Acceptable Manufacturers:
   1. Watts Regulator Co.
   2. Eclipse, Inc.
   3. Perfection Corp.

2.3 PIPING AND EQUIPMENT IDENTIFICATION:

A. Pipe Identification:

   1. Each piping system furnished and installed under this work shall be identified and the direction of flow indicated by a prefabricated coiled plastic colored label.

   2. Labels shall comply with ASME A13.1 with regard to color, letter height, and marker size. The labels shall have black or white lettering and flow arrows on colored backgrounds and shall not require adhesive. The background colors shall conform to the color schedule shown in this Article.

   3. For use outdoors use Polyester/Tedlar laminated material, MSI model MS-977, or equal. For piping with OD greater than 6” provide the label manufacturers stainless steel straps to secure label to piping.

   4. The size of the lettering and label shall be such that the lettering can be easily read from the floor and the colors easily discernible.

   5. Acceptable Manufacturers:
      a. Marking Services Incorporated (MSI)
      b. Idento Metal Products Co., Idento Bands
      c. Setmark

B. Equipment Identification:

1. Provide white lamacoid plate for each and every piece of equipment installed in this work.
   a. Lettering on plate shall be black, with size of lettering to suit equipment.
   b. Lettering shall be minimum of 3/8-inch in height.
   c. Plates shall be riveted or bolted to equipment.

2. Equipment to include, but not limited to:
   a. Package Rooftop AC Units
   b. Exhaust Fans
   c. Relief Vents
   d. Etc.

C. Acceptable Manufacturers:
1. Marking Services Incorporated, (MSI)
2. LEM Products
3. Seton
4. Craftmark

2.4 ELECTRIC MOTORS:

A. General:
1. The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

B. Electric Motors:
1. All electric motors shall comply with requirements of NEMA, UL, ANSI/IEEE 112 and NEC, suitable for intended load, voltage, phase, frequency, service, and location.

2. Limit maximum motor speeds to 1750 rpm, unless otherwise specified.

3. Motors 1/2 HP and larger shall be 3 phase, 60 Hz, squirrel cage induction motors unless specifically specified to the contrary in subsequent Sections of this Division.
   a. Refer to Drawings for voltage requirements.
   b. Totally enclosed motors rated 3/4 HP, 1200 rpm, or 1 HP and larger, and all drip-proof motors shall have a 1.15 continuous-duty service factor at 40^{o}C ambient temperature.
   c. Insulation system shall be NEMA Class F or better.
   d. Provide double-shielded, grease-lubricated ball bearings with grease pockets on each side for regreasing in service.
   e. Provide inlet and outlet grease connections in 7.5 HP and larger motor housings for each bearing.
   f. Motors 5 HP and smaller and all roof-mounted equipment motors shall be provided with factory sealed, permanently lubricated ball bearings.

4. Motors smaller than 1/2 HP shall be single phase, 110 volt permanent split-capacitor type with integral thermal overload protection. Bearings shall be factory sealed, permanently lubricated ball type.

5. Provide totally enclosed motors, or suitable protection per NEMA Standards, in locations exposed to the weather or dripping water and in air handling units downstream of cooling coils and heat recovery coils. Other motors shall be open drip-proof.

6. Multi-speed motors shall be provided where specifically scheduled.

7. Motors feed by variable frequency drives (VFD) shall be specifically designed by motor manufacturers for variable frequency drive application.

8. Minimum Efficiency and Power Factor: Minimum Power Factor shall be 85 percent minimum, in all sizes, and minimum efficiency shall be as follows, for 1,750 rpm motors as tested in accordance with NEMA Table 12-6D. The minimum efficiencies shall be guaranteed.

9. Overload protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

10. Noise rating: Comply with ANSI/NEMA MG 1."Quiet" rating on motors located in occupied spaces of building.

11. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

C. Acceptable Manufacturers:
1. Reliance
2. Baldor
3. US Motors
4. Westinghouse
5. Lincoln
6. General Electric

2.5 MOTOR STARTERS, ELECTRICAL DEVICES, AND WIRING

A. Motor Starters:

1. Magnetic motor starters for equipment provided under the Mechanical Work shall be furnished by the Mechanical Contractor and turned over to the Electrical Contractor for installation, unless otherwise noted.
   a. Magnetic motor starters shall be provided as part of motor control centers shall be provided and installed by Electrical Contractor

2. Unless otherwise noted, magnetic motor starters shall be furnished in NEMA 4 enclosure for outside installation and NEMA 1 enclosure for inside installation, with three thermal overloads for three- phase motors and one overload element for single-phase motors. All overloads shall be ambient compensated.

3. Furnish single phase motors with manual motor starters having integral overload protection.

4. Furnish 3-phase motors with full voltage, magnetic across-the-line starters unless noted otherwise.

5. Provide thermal overload protection for all 3-phase legs. Provide motor starters with single phase protection.

6. Provide fail-open auxiliary contacts, pre-wired to a terminal strip, for future remote alarm wiring and run-time totalization. Refer to Division 16.

7. Provide equipment starters with an adequate control transformer, complete with fuse protection, to supply 120 volt source for control circuit, regardless of line voltage.

B. Manual switches shall have pilot lights and extra positions for multi-speed motors.

C. Overload protection: Melting alloy type thermal overload relays.

D. Magnetic Starters:
1. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
2. Trip-free thermal overload relays, each phase.
3. Interlocks, pneumatic switches, electric relays and similar devices as required for coordination with control requirements of Division 15 Controls Sections.
4. Externally operated manual reset.
5. Under-voltage release or protection.

E. Motor connections:
1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

2.6 FIREPROOFING

A. Fireproofing to be installed at all pipe and duct penetrations of rated assemblies.

B. Fireproofing to be UL Rated fire stop material.

C. Acceptable Manufacturers:
1. Hilti
2. 3M Pro-Set
3. Or Equal

PART 3 EXECUTION

3.1 ROOF FLASHING:

A. Provide pipe flashings as noted on the Drawings.

B. Flue and duct flashings and storm collars shall be securely clamped around flue or duct storm collar or counterflashing, above flashing.

3.2 DIELECTRIC UNIONS:

A. Install dielectric unions in the following locations:
1. In all metallic water and gas service connections into the building within 5 feet of the building wall. Install adjacent to the shut-off valve or cock and above ground where possible.
2. At points of connections where copper water lines connect to steel domestic water heater tanks and other equipment.
3. At points in piping where dissimilar metal pipes are connected together.
4. Any special applications shown on the Drawings.
5. Where steel or cast-iron pipe in the ground connects to copper or brass piping above the ground, the transition from steel or cast- iron pipe to the copper or brass pipe shall be made above ground in all cases and in an accessible location where practicable.
6. Where copper or brass piping is connected to steel or cast-iron piping and the connection is buried in the ground, the connection shall be covered with coal tar protective tape extending outward a minimum of 5 feet on all pipes, from the point of connection. The tape shall have a minimum thickness of 10 mils and a maximum thickness of 12 mils and shall be applied so as to provide at least two full thicknesses

of the tape over the piping. A primer, specifically designed for use with the tape, shall be used. The piping shall be thoroughly cleaned before any tape or primer is applied.

3.3 PIPE AND EQUIPMENT IDENTIFICATION:

A. Identification shall be applied to all piping, except piping located in furred spaces without access to permit entrance of personnel, and piping buried in the ground or concrete.

B. Underground pipe identification shall consist of a buried, continuous, preprinted, bright colored, plastic ribbon cable marker provided for each underground pipe.

C. The legend and flow arrow shall be applied at the following locations:
1. All valve locations,
2. All points where piping enters or leaves a wall, partition, cluster of piping, or similar obstruction
3. All exposed locations
4. At approximately 20-foot intervals on pipe runs.

D. Practical variations or changes in locations and spacing may be made with the specific approval of the Architect to meet specific conditions.

E. Wherever two or more pipes run parallel, the printed legend and other markings shall be applied in the same relative location so that all piping is easily identified.

F. The marking shall be located so as to be readily conspicuous at all times from any reasonable point of vantage.

G. Lettering size and label colors are to be per ASME/ANSI A13.1 Pipe Marking Standards.

3.4 MOTORS:

A. Motors furnished in the Mechanical Work shall be furnished by the Mechanical Contractor, but such equipment shall be delivered to the Electrical Contractor for mounting and connecting to power wiring. Coordinate all motor starter requirements with Electrical Contractor.

3.5 MOTR STARTERS SWITCHES, AND WIRING:

A. Starters located in motor control centers will be provided under the Electrical Work. Contractor is referred to electrical drawings for motors served by motor control centers.

B. Starters furnished by the Mechanical Contractor to be delivered to the Electrical Contractor for mounting and connecting to power wiring. Coordinate all motor starter requirements with Electrical Contractor.

3.6 FIREPROOFING:

A. Pack the annular space between the pipe sleeves and the pipe and between duct openings and ducts through all floors and walls with UL listed fire stop.

B. Fireproofing system to be installed in strict accordance with manufacturer's written instructions and details.

3.7 PAINTING:

A. Perform all priming and painting on the equipment and materials as specified herein.

B. Exposed piping and unfinished portions of equipment to be painted shall be cleaned of grease, oil, rust, or dirt in preparation for painting.

C. Where applicable, remove pipe clamps prior to painting so that entire pipe is painted. Provide temporary support as required. Re-install clamps after priming/painting is complete.

D. Priming:

1. Contractor to prime all exposed ferrous metals, including piping, which are not galvanized or factory-finished.
   a. Black steel pipe exposed to weather shall be cleaned and primed with one coat of Rust-Oleum, or equal, #1069 primer. Color to be Grey.

E. See Painting Section for detailed requirements.

3.8 ELECTRICAL WORK:

A. Adequate working space shall be provided around electrical equipment in compliance with the National Electric Code and other applicable codes or ordinances. The mechanical work shall be coordinated with the Electrical Work in order to comply with these requirements. Any work which does not conform to these regulations shall be properly corrected without additional cost to the Owner.

B. Furnish and install all line voltage and low-voltage temperature control wiring in the Mechanical Work by the Temperature Control SubContractor, including all interlock wiring between motor starter coils, interlock relays, and temperature control equipment. Unless noted otherwise, this does not include primary control wiring between starters and push button or other manual starter switch or branch power circuits required for temperature control systems.

C. Temperature control equipment, including relays shown on control diagram, shall be furnished and installed by the Temperature Control Subcontractor.

D. Equipment furnished in this work that is factory wired but requires modification to internal wiring to meet specifications or drawing requirements shall have such internal modifications made at factory before shipment.

E. All electrical work and equipment, including internal wiring, must comply with applicable codes and applicable portions of electrical specifications. Run line and low-voltage control wiring in conduit. Conduit for temperature control wiring shall be responsibility of Mechanical Contractor and shall be of type specified in electrical specifications.

3.9 DEMOLITION

A. Refer to Division 1 sections for general demolition requirements and procedures.

B. Disconnect, dismantle, and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades
1. Piping to be removed: Remove portion of piping indicated to be removed. Cap or plug remaining piping with same or compatible piping material.
2. Piping to be abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system to be evacuated per EPA requirements.
3. Equipment to be removed: Drain down and cap remaining services and remove equipment.

4. Equipment to be removed and re-installed: Disconnect and cap services and remove, clean, and store equipment. When appropriate, re-install, reconnect, and make equipment operational.
   a. If existing equipment which is to be re-installed is damage, contact architect prior to removal. Contractor to take pictures of any damaged equipment prior to its removal and submit pictures to Architect.
   b. Equipment damaged during removal, storage, or re-installation shall be the Contractor's responsibility and is to be replaced with new at no additional cost to the owner.
5. Equipment to be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, removed damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.10 CARE AND CLEANING:

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

B. Drain and flush piping to remove grease and foreign matter. Thoroughly clean out flush valves, traps, strainers, and pressure-reducing valves.

C. Keep the interior of all ductwork free of dirt, dust, loose insulation, and other foreign materials at all times.

D. Clean out and remove surplus materials and debris resulting from the work, including surplus excavated material.

3.11 OPERATION TEST:

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.12 CLEANING UP:

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 23 05 00

SECTION 23 05 93 – AIR AND WATER SYSTEM BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. This section includes total system balance, as defined by AABC, which constitutes the process of testing, adjusting, and balancing each system component so that the entire system produces the results for which it was designed. Testing results of total system balance shall be accepted by the Mechanical Engineer of Record and Owner

1.2 QUALITY ASSURANCE

A. Obtain the service of an independent test and balance (TAB) agency that specializes in, and whose business is limited to, testing, analysis, and balancing of air distribution and hydronic systems.

B. Balance agency shall be a member of Associated Air Balance Council.

C. Balance agency shall be a member of Associated Air Balance Council (AABC), or National Environmental Balancing Bureau (NEBB).
   1. Company shall be a member of AABC or NEBB for a minimum of 5 years.

D. Work shall be done by qualified engineering technicians and trained personnel, using instruments certified accurate to limits used in standard practice for testing and balancing of hydronic and air distribution for heating-cooling systems. Agency shall field test air and hydronic flows in accordance with methods set up by Associated Air Balance Council, National Standard Volume 1, latest edition.

E. Approved Balancing Firms: Obtain service from one of the following firms (No others will be considered):
   1. RS Analysis
   2. Raglen System Balance
   3. MESA 3

F. AABC Compliance: Comply with AABC's "National Standards," Volume 1, as applicable to mechanical air and hydronic distribution systems and associated equipment and apparatus.

G. Industry Standards: Comply with ASHRAE recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

H. Reference Standards: Comply with the following Standards:
   1. AABC - Associated Air Balance Council - A National Standard Volume 1.
   2. ASHRAE - American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.
   3. AMCA Publication 203, "A Guide to the Measurement of Fan System Performance in the Field."
   4. ASHRAE HVAC Applications Handbook, Chapters 34 and 42 as applicable.
   5. ADC Test Code No. 1062, "Equipment Test Code."
   6. ANSI A1.4, Specification for Sound Level Meters.
   7. ANSI S1.11, Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets.

1.3 WORK INCLUDED

A. Test and balance of existing and new air distribution system, hydronic systems, and associated equipment.

B. Setting and adjusting speed and volume of systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required by contract documents.

C. Component types of testing, adjusting, and balancing specified in this section includes the following as applied to mechanical equipment:
   1. Fans
   2. Packaged Rooftop AC Units
   3. Ductwork systems
   4. Relief vent and/or power exhaust section of economizers.

D. TAB agency shall perform the following during installation phase of systems:
   1. Study design specifications and engineering Drawings and prepare schedule to physically inspect mechanical equipment for hydronic and air distribution systems to be tested and balanced.
      a. Contractor shall provide TAB agency with one copy of Contract Drawings and specifications, mechanical equipment submittals, and change orders necessary for proper balancing of air distribution systems.
   2. TAB agency shall make periodic field inspections prior to closing in portions of systems to be balanced. Agency shall verify to its satisfaction that all work, fittings, dampers, balancing devices, etc. are properly fabricated and installed as shown or specified and that Agency will be able to properly balance system.
   3. Prepare test and balancing schedule, test record forms, and necessary technical information about hydronic and air distribution systems for installed heating-cooling equipment.
   4. Recommend adjustments and/or corrections to mechanical equipment and hydronic and air distribution systems that are necessary for proper balancing of systems.
      a. Corrections required based on TAB Contractor field inspections shall be made at no additional cost to the owner.

1.4 SUBMITTALS:

A. Contractor data:
   1. Provide TAB Contractor company information.

B. Field Inspection Report:
   1. TAB Contractor to provide written verification of field inspections.
      a. Include date of inspection and list of all items to be corrected prior to balance.

C. TAB Contractor to provide Test Reports as follows:
   1. Submit data on printed report forms published by AABC.
   2. Include identification and types of instruments used and their most recent calibration date with submission of final test report.
   3. Reports to have computer generated drawings. Drawings to include: general building layout, ductwork and piping layout, HVAC equipment, and air inlet/outlet locations.
      a. Hand drawn/numbered drawings shall not be accepted.
   4. Reports to be stamped and signed licensed TAB Contractor.
   5. Submit three copies of complete test report prior to final acceptance of project.

D. Balance agency shall submit the results of tests in this SECTION for review by the Architect.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS:

A. Except as otherwise indicated, use same products as used by original installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.
   1. At tester's option, plastic plugs with retainers may be used to patch drilled holes in ductwork and housings.

2.2 TEST INSTRUMENTS:

A. Utilize test instruments and equipment for test and balance work required, of type, precision, and capacity as recommended in the following test and balance standards:
   1. Comply with AABC's Manual "AABC National Standards," Volume 1.

PART 3 EXECUTION

3.1 BALACING:

A. Upon completion of HVAC installation, balance agency shall complete tests, analysis, and balance of air handling systems for heating-cooling equipment.
   1. It is the intent of the project to set total CFM at equipment along with outside air settings. For equipment within concealed ductwork, total AC Unit readings will only be required. For equipment with new rooftop ductwork distribution, readings at individual branch ducts will be required.

B. This report shall include as minimum, but not be limited to, following design and actual information:

   1. Air-Moving Equipment Data:
      a. Fan or unit number.
      b. Location.
      c. Area served.
      d. Manufacturer.
      e. Model number and serial number.
      f. Design and actual air-flow measurements:
         1) Total CFM.
         2) Return air CFM
         3) Outdoor air CFM
         4) Relief air CFM
         5) Total/external static pressure in w.g.
         6) Approximate suction static pressure in w.g.
         7) Approximate discharge static pressure in w.g.
         8) Fan rpm

   2. Rated and Actual Motor Data:
      a. Horsepower / Break-horsepower
      b. Phase
      c. Voltage.
      d. Amperage.

   3. Duct Velocity Traverse Data:
      a. Fan or unit number
      b. Design and actual CFM

c. Duct division signs and area.
d. Design and actual average velocity
e. Duct static pressure average velocity
f. Traverse location
g. Traverse measurements in fpm (show grid pattern)

4. Exposed Rooftop Ductwork:
   a. Design and actual velocity in feet per minute (FPM)
   b. Design and actual CFM

5. Other information required to establish completely balanced systems.

3.2 BALANCE REQUIREMENTS:

A. Make allowance for air filter resistance at time of tests. Balance main air supplies at design air quantities and at an air resistance across filter bank midway between design specifications for clean and dirty filters.

B. Balance work within the following tolerances:
   1. Packaged unit supply CFM, supply/return ducts, and exhausts fans: balance within -5% / +10% of design CFM.
   2. Outside Air Inlets: balance within -0% / +10% of design CFM.

C. HVAC systems shall be balanced at normal "minimum outside air" condition. Where such systems are required to deliver 100-percent return air or a variable amount of outside air, as indicated in specifications for automatic temperature control sequences, total CFM test shall be repeated for 100-percent return air and maximum outside air shall agree with conditions found under maximum outside air operation before system is considered to be in balance. Adjustments of proper dampers shall be made to achieve balance and marked so that control systems contractor may set damper motors accordingly.

D. Take static pressure readings with inclined manometer. Take air velocity readings with instruments of recent calibration. Take final velocity readings with Alnor Velometer, Anemotherm or Vane Type Anemometer, calibrated prior to test and recalibrated at end of test. Include certified correction curves for each calibration as part of record. Certify instruments accurate to standards currently used in common practice for system balance work. Use test cones for diffusers.

E. Run tests with supply, return, and exhaust systems operating and doors, windows, etc. closed or under regular traffic. If possible, make final readings with cooling coils under load to ensure that static pressures are at maximum.

F. Work with temperature Control Subcontractor in adjustment of automatic dampers, valves, thermostats, etc. required to maintain proper temperatures in all portions of building.

G. Contractor responsible for installing heating, cooling, and ventilating equipment shall make any changes, additions, or modifications to dampers, fan drives and motor sheaves, pump impellers, motors, and other equipment necessary for proper air and hydronic balance.

H. Balance of systems shall be reviewed by Architect and during this review Mechanical Contractor shall furnish men, materials, ladders, etc. to enable Architect to take all readings as he may direct. If errors are found, Balancing Agency shall readjust system to satisfaction of Architect.

END OF SECTION 23 05 93

SECTION 23 31 00 – DUCTWORK

PART 1 GENERAL

1.1 SUMMARY

A. This section includes sheet metal materials, fasteners, supports, and duct construction classifications for:
   1. Supply, return, and exhaust systems.

1.2 REFERENCES

A. AABC – Associated Air Balance Council Manual: National Standards for Total System Balance

B. ANSI – American National Standard Institute

C. ASHRAE Standards: Comply with American Society of Air Conditioning, Refrigeration, and Air Conditioning Engineers Handbook.

D. NFPA – Compliance. Comply with ANSI/NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems,* and ANSI/NFPA 90B *Standard for the Installation of Warm Air Heating and Air Conditioning Systems,* latest accepted edition.

E. CBC – California Building Code

F. CFC – California Fire Code

G. CMC – California Mechanical Code

H. Local Codes

I. SMACNA – Sheet Metal and Air Conditioning Contractor's National Association, Inc.
   1. Duct Construction Standards
   2. Fire damper and heat stop guide.
   3. HVAC Systems testing adjusting and balancing.
   4. Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Pipe systems.

J. UL – Underwriters' Laboratory Standards for Safety: referred to as UL 181, UL 555, etc.

1.3 QUALITY ASSURANCE

A. Contractor to comply with all the above referenced standards.

B. The above referenced standards may be superseded by notes and details on Drawings and in specification.

C. Where two or more references are in conflict, the most stringent, as determined by the Architect, shall take precedence.

D. Flame-Smoke Ratings: All products used in ductwork system to comply with flame-spread index of 25 or less, fuel-contributed index of 50 or less, and smoke-developed index of 50 or less.

E. Installer: A firm with at least three years of successful installation experience on projects similar to that required for this work.

F. Fabricate all ductwork with sheet metal. Fiberglass ductwork will not be accepted.

G. Duct liner to be certified by Greenguard: Greenguard Environmental Institute, independent testing of products for emissions of respirable particles and Volatile Organic Compounds (VOCs), including formaldehyde and other specific product-related pollutants. Provides independent, third-party certification of IAQ performance. Certification is based upon criteria used by EPA, OSHA and WHO

1.4 SUBMITTALS

A. Submit typical shop standards and/or SMACNA details for each class of duct specified. Indicate the following for each standard:
   1. Gauge sizes and joint details
   2. Pressure Class
   3. Seam Construction
   4. System type (e.g. supply air, return, air, etc.)

B. Submit shop drawings for ductwork including elevations and showing all terminal units and air devices connections. Drawings shall be a minimum scale of ¼”=1’-0” and be coordinated with all other trades.

C. Record Drawings: At project closet-out, submit Record Drawings of installed ductwork, duct accessories, and inlets / outlets in accordance with the requirements of Division 1.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Duct Connection Systems:
   1. Ductmate Industries, Inc.
   2. Travers Duct Connection (TDC)
   3. or equal

B. Duct Sealants
   1. United McGill Corp.
   2. Ductmate Proseal
   3. Or Equal

C. Duct Liner
   1. Johns Manville - Linacoustic
   2. Owens Corning Fiberglas Corporation – Aeroflex Plus
   3. Certainteed Corporation - Toughgard

D. Duct adhesives
   1. Fosters Adhesive – 85-462
   2. Swifts Adhesive – 7336
   3. Or Equal

2.2 DUCT CONSTRUCTION CLASSIFICATIONS:

A. General: Construct and seal ductwork in accordance with SMACNA pressure classifications and seal classes listed for ductwork systems involved.

1. Minimum duct gauge for concealed ductwork to be 26 gauge.

B. Rectangular Ductwork:
   1. +2" W.G. Class ductwork:
      a. Supply air Ductwork downstream of terminal boxes.
      b. Constant volume supply air ductwork in systems without terminal boxes

   2. -2" W.G. Class ductwork:
      a. General exhaust ductwork.
      b. Return Air Ductwork

2.3 GENERAL:

A. All duct sizes listed on drawings are external sizes.

B. Galvanized Sheet Steel to be lock-forming quality, ASTM A924 and ASTM. Coating to be Designation G90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
   1. Provide mill certification for galvanized material at request of IOR.

C. Tapers to be as follows:
   1. Limit diverging tapers to a maximum of 30 degrees.
   2. Limit expanding tapers to a maximum of 20 degrees.

D. Run ductwork parallel to adjacent walls unless shown otherwise on plans.

E. Ductwork exposed to weather to be cross-broken to shed water.
   1. At contractor's option, ductwork can be manufactured with a sloped top, with a minimum angle of 5 degrees.

F. Joint Sealing:
   1. Seal all concealed ductwork within the building, all ductwork within mechanical rooms, and all ductwork exposed to weather air tight. Seal all standing seams, transverse joints, manufactured joints and seams with duct sealant. Duct Sealant to be rated for indoor and outdoor use.
   2. Seal punched holes, corner cracks, and all sheet metal screws.
   3. After testing, reseal joints found to be leaking.
   4. At ductmate joints, in addition to ductmate gaskets, seal all bolted corners to eliminate air leakage at corners.
   5. Pressure sensitive tapes shall not be considered.

G. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.
   1. Ducts to penetrate perpendicular to walls, ceilings and floors.

H. Internal Duct Liner:
   1. Provide internal duct liner as follows:
      a. All supply and return air ductwork exposed to weather.
      b. Elsewhere as indicated on the drawings.

   2. Internal duct liner exposed to weather to be as follows:
      a. 2" thick, 1.5-pound density (minimum) with matt facing.
      b. Thermal Performance - C Value – 0.14 BTU / (h * FT^2 * ^oF) – minimum
      c. Thermal Performance - R Value – 8.3 (h * FT^2 * ^oF) / BTU – minimum
      d. Liner to be CertainTeed, ToughGard R Duct Liner, Type 150, or equal.

3. Cement duct liner in place with nonflammable, non-hardening duct adhesive. Seal up all raw edges of insulation inside ductwork with adhesive.

4. Provide sheet metal weld pin fasteners and washers on all duct work on 12-inch intervals with the first row within 3 inches of the leading edge of each piece of insulation and 4 inches from corners. No substitutions on fastening method will be allowed.

5. Duct liner and adhesive shall not exceed flame-spread rating of 25 and smoke-developed rating of 50, all in conformance with NFPA 90A.

6. Provide metal nosing at all locations where liner is preceded by unlined metal.

I. Ductwork Support: Provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim, and angles for support of ductwork, unless noted otherwise.

J. Miscellaneous Ductwork Materials:
1. Duct Joints: Install duct sealers, pop rivets, or sheet metal screws at each fittings and joint. Use a minimum of #10 galvanized sheet metal screws.

2.4 2" W.G. RECTANGULAR DUCT CONSTRUCTION/FABRICATION:

A. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.
1. California Mechanical Code (CMC)
2. SMACNA HVAC Duct Construction Standards, latest Edition.

B. Fabricate Ducts with minimum gauges and joint reinforcement as follows:

Duct Dimension	Minimum Gauge	Joint Reinforcement per CMC
Up through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4

C. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown.

D. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper.

E. Provide drive slip or equivalent flat seams for ducts exposed in the condition space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

PART 3 EXECUTION

3.1 INSTALLATION OF DUCTWORK:

A. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (leakage class 12 for 2-inch pressure class and leakage class 3 for 4-inch pressure class) and noiseless (no objectionable noise) systems capable of performing each

indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8- inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling.

B. Seal ductwork after installation to seal class required and method prescribed in SMACNA "HVAC Leakage Test Manual," latest edition.

C. Paint inside of duct visible through grille dull black.

D. Duct Supports:
   1. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," latest edition, hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed.
      a. Except where modified in individual paragraphs in this section or detailed on drawings, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap under bottom of duct.
      b. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw through strap at top of duct and one screw through strap at bottom of duct.

E. Where ductwork is exposed, Contractor to paint ductwork, supports, and accessories as directed by Architect.

3.2 CLEANING AND PROTECTION

A. Ductwork being stored on site to be covered and protected from elements. Internally lined ductwork to be stored on jobsite in clean / dry location. Any insulation exposed to water must be discarded immediately and removed from jobsite.

B. Clean ductwork internally, unit by unit as it is installed, of dust, dirt, and debris.

C. Clean external surfaces of dirt and foreign substances which might cause corrosive deterioration of metal or where ductwork is to be painted.

D. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

E. If HVAC System is operated prior to the completion of construction, Contractor to provide temporary filters at all return air and exhaust air grilles. Filters to be 2” thick, MERV 8 filters. Contractor to secure filters in place with tape or wiring. Filters to completely cover grille opening.

3.3 OPERATION TEST:

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.4 CLEANING UP:

A. Upon completion of Work remove materials, equipment, apparatus, and tools, and leave premises clean, neat, and orderly.

END OF SECTION 23 31 00

SECTION 23 33 00 – AIR DUCT ACCESSOREIS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes requirements for the following duct accessories:
   1. Volume Control Dampers
   2. Turning Vanes
   3. Flexible Connections

1.2 QUALITY ASSURANCE

A. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) HVAC Duct Construction Standards (Metal and Flexible), latest edition, for all work in this section.

B. ASHRAE Standards: Comply with American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) recommendations, latest edition, for all work in this section.

C. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."

D. The Diffuser, Register, Grille manufacturer shall provide published performance data for all air inlets/outlets. Performance tests shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

1.3 SUBMITTALS

A. Product data: submit complete data of materials proposed including:
   1. Manufacturer and model number
   2. Clearly indicate all options, trim, and accessories.
   3. Cross reference manufacturer’s cut sheet to fixture callout ID on submittal sheet.

B. Operation and Maintenance Data: submit complete O&M data including:
   1. Maintenance data and parts lists for each type of fixture.
   2. Provide "trouble- shooting" maintenance guide
   3. Include this data within maintenance manual

PART 2 PRODUCTS

2.1 VOLUME CONTROL DAMPERS:

A. General:
   1. Provide dampers throughout the duct system where indicated on the drawings to facilitate complete balancing.
   2. Provide any dampers not shown on drawings but requested by Test and Balance Contractor add no additional charge to the owner.
   3. Locate volume control dampers within 18” of the branch duct take off. Dampers shall not be located at or near the end of the duct branch run.
   4. Provide for each damper quadrant lock device on one end of shaft and end-bearing plate on other end.

a. Quadrant lock device to be Ventlock 641, or equal.
b. End bearing plate to be Ventlok 607, or equal.

5. Provide extended quadrant locks and extended bearing plates for externally insulated ductwork.

B. Rectangular Dampers with either height or width less than 16 inches:
1. Butterfly type damper with 18-gauge steel or duct casing angle reinforced as required.
2. Provide single thickness 16-gauge minimum, galvanized steel blades, welded or permanently bolted to continuous solid 3/8" minimum square shaft. Permanently mark end shaft to indicate blade position and fit with a locking quadrant mounted on outside of frame. Bearings shall be pressed into frame and designed for dynamic requirements

C. Rectangular Dampers with either height or width greater than or equal to 16 inches:
1. Frame with 5" by 1", 16-gauge galvanized steel channel. Blades to be 8" maximum width, extruded aluminum, airfoil blade, opposed blade, having shafts/bearings designed to meet dynamic requirements, positively locked to shafts.
2. Control shafts to be 3/8" square, plated steel, permanently marked to indicate blade position and fitted with locking quadrant mounted on outside of frame.
3. Provide single thickness 16-gauge minimum, galvanized steel blades, welded or permanently bolted to ½" minimum diameter through shaft. Permanently mark end shaft to indicate blade position and fit with a locking quadrant mounted on outside of frame. Bearings shall be pressed into frame and designed for dynamic requirements

D. Acceptable Manufacturers:
1. Air Balance Inc.
2. Ruskin Manufacturing Company
3. Greenheck

2.2 TURNING VANES

A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards," latest edition.

B. Acceptable Manufacturers:
1. Duro-Dyne Corporation
2. Ductmate
3. Or equal

2.3 FLEXIBLE CONNECTIONS

A. Furnish and install flexible connections at following locations:
1. Supply and return duct connection to packaged rooftop AC Units with horizontal ductwork.
2. Flexible connections will not be required for curb-mounted, roof- type exhaust fans or packaged downflow AC Units.

B. Flexible duct connections shall be preassembled flexible connectors constructed of coated glass fabric applied in accordance with manufacturer's recommendations.

C. Install sheet metal band completely around duct or fan outlet, at end of flexible connection. Fasten with metal screws through band and coated glass fabric. Space screws approximately 4" apart.
1. Provide with TDC/TDF connectors where connecting to like ductwork.

D. Flexible Connections to be as follows:

1. For all equipment: Duro-Dyne Model Metal Fab, or equal.
   a. Provide with Neoprene (commercial/specification grade) fabric.
      1) Neoprene to be 30 oz./square yard,
   b. Provide with 4" fabric with 4" metal connectors on each end.
   c. Minimum 24 gauge.

E. Provide galvanized sheet metal sun shield over flexible connections located outdoor.

F. Acceptable Manufacturers:
   1. Duro-Dyne Corporation
   2. Ventfabrics, Inc.
   3. Ductmate PROflex
   4. Or Equal

PART 3 EXECUTION

3.1 GENERAL:

A. Install duct accessories in accordance with manufacturer's installation instructions with applicable portions of details of construction as shown in SMACNA standards and in accordance with recognized industry practices to ensure that products serve intended function.

3.2 INSTALLATION OF VOLUME CONTROL DAMPERS:

A. Provide volume control dampers at all supply, return, and exhaust branch ductwork and elsewhere where shown on the drawings.

B. Locate volume control dampers at or near branch take off. Volume Control dampers shall not be located at the end of branch duct.

3.3 INSTALLATION OF TURNING VANES:

A. Install turning vanes in square or rectangular 90-degree elbows in supply, return, and exhaust air systems and elsewhere as indicated.

3.4 INSTALLATION OF FLEXIBLE CONNECTIONS:

A. Install flexible connection in accordance with manufacturer's installation instructions.

B. Furnish and install flexible connections at following locations:
   1. Duct connection of packaged rooftop equipment (both supply and return) which have horizontal connected ductwork.
      a. Flexible connections will not be required for curb-mounted, roof- type exhaust fans or downflow packaged AC Units.

3.5 CARE AND CLEANING:

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim installed as part of this work. Leave systems and equipment in satisfactory operating condition.

3.6 CLEANING UP:

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 33 00

SECTION 23 34 00 – EXHAUST FANS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes exhaust systems including:
   1. Roof Exhaust Fans
   2. Kitchen exhaust fans
   3. Roof Mounted Air Intake/Relief Hoods
   4. Roof Curbs

1.2 REFERENCES

A. AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 – Load Ratings and Fatigue Life for Roller Bearings.

C. AMCA 99 – Standards Handbook

D. ACMA 300 – Test Code for Sound Rating Air Moving Devices

E. AMCA 301 – Method of Calculating Fan Sound Ratings form Laboratory Test Data

F. ANSI B3.15

G. California Electrical Code (C.E.C.)

H. SMACNA – HVAC Duct Construction Standards

1.3 QUALITY ASSURANCE

A. Conform to AMCA bulletins regarding construction and testing. Fans shall bear AMCA certified rating seal.

B. Fans of similar type shall be by the same manufacturer.

1.4 SUBMITTALS

A. Product Data: Submit complete data of materials proposed including the following:
   1. Manufacturer.
   2. Model.
   3. Fan Type
   4. Wheel type
   5. Fan Construction Class
   6. Fan size and arrangement
   7. Dimensional data including bolt hole locations
   8. Fan Weight
      a. Were fans are mounted on vibration isolators, provide corner operating weight data for each fan.
   9. Air flow capacity, fan curves, and efficiency data
   10. Static pressure
   11. Fan motor drive
   12. Motor HP and Fan bHP
   13. Sound Power: discharge and inlet for each octave band.

B. In cases of Substitution, equivalent fan shall not (when compared to basis of design fan):
   1. Increase motor horsepower
   2. Increase bHP by more than 5%
   3. Increase noise level
   4. Increase tip speed by more than 10%
   5. Increase air inlet velocity by more than 20%
   6. Change motor type

C. Maintenance Data: Submit operations and maintenance data and parts list for each fan type. Include this data in Maintenance Manual.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

A. General Exhaust Fans, Kitchen Exhaust, and Roof Exhaust fans:
   1. Loren Cook
   2. Greenheck
   3. Or Equal

B. Roof Mounted Air Intakes / Relief Hoods
   1. Loren Cook
   2. Greenheck
   3. Or Equal

C. Roof Curbs
   1. By Fan Manufacturer
   2. Or Equal

2.2 GENERAL

A. Provide motors so that they cannot be overloaded above nameplate rating throughout the full speed range of the adjustable pitch driving sheave.

B. Fan wheels shall be balanced statically and dynamically near operating speed.

C. Provide drives and guards conforming to the requirements hereinbefore specified.

D. Fan construction, speed, noise level, tip speeds, outlet velocities and efficiencies will be taken into consideration in approval of fans offered. Fans shall be as scheduled on drawings, or approved equal.

2.3 ROOFTOP CENTRIFUGAL EXHAUST FAN – UPBLAST – DIRECT DRIVE.

A. Roof exhaust fans shall be upblast centrifugal direct drive type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

B. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. Windbands shall have a rolled bead for added strength and shall be joined to curb caps with a leak proof continuously welded seam.

C. Motors shall be mounted out of the air-stream on vibration isolators. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.

D. A disconnect switch shall be factory installed and wired from the fan motor to a junction box within the motor compartment. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.

E. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.

F. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

G. Provide with the following Options and Accessories:
1. Aluminum Birdscreen
2. Gravity backdraft Dampers
3. UL/cUL 705 Electrical
4. Drain connection
5. Speed Controls
6. NEMA 3R and EXP Disconnect Switches

2.4 ROOFTOP CENTRIFUGAL EXHAUST FAN – UPBLAST – BELT DRIVE.

A. Roof exhaust fans shall be upblast centrifugal belt driven type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. Windbands shall have a rolled bead for added strength. Windband shall be welded to curbcaps with a leak proof continuous seam.

B. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the airstream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.

C. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.

D. Motor pulleys shall be adjustable for final system balancing. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.

E. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.

F. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

G. Provide with the following Options and Accessories:
1. Aluminum Birdscreen
2. Gravity backdraft Dampers

3. UL/cUL 705 Electrical
4. Drain connection
5. NEMA 3R and EXP Disconnect Switches

2.5 KITCHEN ROOFTOP CENTRIFUGAL EXHAUST FAN – UPBLAST – BELT DRIVE.

A. Roof exhaust fans shall be upblast centrifugal belt driven type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. Windbands shall have a rolled bead for added strength. Windband shall be welded to curbcaps with a leak proof continuous seam.

B. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the airstream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.

C. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.

D. Motor pulleys shall be adjustable for final system balancing. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.

E. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.

F. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

G. Provide with the following Options and Accessories:
1. Aluminum Birdscreen
2. Gravity backdraft Dampers
3. UL/cUL 705 Electrical
4. Drain connection
5. Speed Controls
6. NEMA 3R and EXP Disconnect Switches
7. Vented Curb Extensions
8. Heat Baffles
9. UL/cUL 762 Grease
10. Non-Stick Wheel
11. Clean Out Port
12. Grease Trap w/Drain Connection
13. Hinged Curb Cap Kit w/Cable
14. High Temp Grease Bearings

2.6 ROOF MOUNTED AIR INTAKE/RELIEF HOODS

A. Provide hoods, curb mounted, of size noted on drawings and as specified herein. Hood style and manufacturer shall match the centrifugal roof exhausters.

B. Bird Screens: Provide removable bird screens, 1/2" mesh, 16 gauge aluminum or brass wire.

C. Provide backdraft damper in neck of each relief air hood.

2.7 ADAPTOR CURBS

A. Provide manufacturer's standard shop-fabricated units, modified if necessary to comply with project requirements.

B. Unless scheduled otherwise, curbs to be fabricated of 14 gauge metal.

C. Contractor to field measure existing curbs to confirm adaptor curb size as may be required.

PART 3 EXECUTION

3.1 GENERAL

A. Install fans and ventilators in accordance with equipment manufacturer's installation instructions, and with recognized industry practices, to ensure that equipment complies with requirements and serves intended purposes.

B. Supply and install sheaves as necessary for final air balancing.

C. Ensure air distribution equipment is wired properly, with rotation in direction indicated and intended for proper performance.

3.2 ADAPTOR ROOF CURBS:

A. Provide and install adaptor roof curb as required to transition from existing roof curb to new fan requirements.

B. Prior to ordering roof curbs, Contractor to field verify existing curb dimensions and provide new curbs to fit existing.

3.3 START UP

A. Inspect equipment after installation to verify installation is in accordance with specifications and manufacturers installation guidelines. Verify equipment is lubricated, proper belt tension, and that equipment is otherwise ready to operate.

B. Perform air side test and balance as applicable.

3.4 CLEANING UP:

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like and leave premises clean, neat and orderly.

END OF SECTION 23 34 00

SECTION 23 74 00 – PACKAGED AIR CONDITIONING UNITS

PART 1 GENERAL

1.1 SUMMARY:

A. This section provides requirements for split system ducted air conditioning units.

1.2 QUALITY ASSURANCE:

A. Flame-Smoke Ratings: Except as otherwise indicated, provide air conditioning unit thermal insulation with flame-spread index of 25 or less, fuel-contributed index of 50 or less, and smoke-developed index of 50 or less.

B. AMCA Standards: Comply with Air Movement and Control Association (AMCA) Standards as applicable to testing and rating fans.

C. SMACNA Compliance: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) ductwork construction standards as applicable to air conditioning units.

D. AGA Certification: Gas fired equipment shall be AGA certified.

E. ARI Certification: Coils shall comply with ARI Standard 410.

F. UL Compliance: Provide electric components for air conditioning units which have been listed and labeled by Underwriters Laboratories or by a testing organization of equal standing.

G. Only Manufacturer's Authorized Commercial and Industrial Equipment Suppliers shall be allowed to supply equipment for this project. Equipment suppliers who's primary business is residential and are not a Manufacturer's Authorized Commercial and Industrial Equipment Supplier shall not be accepted on this project due to lack of a service company capable of proper support on a commercial quality project.

1.3 SUBMITTALS:

A. Submit the following information for each packaged unit:
   1. Manufacturer's product data and cut sheet for each unit.
   2. Submit manufacturer's specifications for air conditioning units showing dimensions, weights, capacities, ratings, certified fan performance with operating point clearly indicated on a fan curve, motor electrical characteristics, gauges, finishes of materials, and installation instructions.

B. In cases of Substitution, equivalent fan shall not (when compared to basis of design fan):
   1. Increase unit scheduled weight.
   2. Decrease unit SEER or EER Value
   3. Increase bHP by more than 5%
   4. Require an adaptor curb when one is currently not required.
   5. Increase the height of an adaptor curb from specified.
   6. Rotate unit to function with adaptor curb.

C. Maintenance Data:
   1. Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists.

2. Include this data in maintenance manuals only.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver air conditioning units with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.

B. Handle air conditioning units carefully to avoid damage to components, enclosures, and finish. Do not install damaged components; replace and return damaged components to air conditioning unit manufacturer.

PART 2 PRODUCTS

2.1 GENERAL:

A. Extent of air conditioning unit work is indicated by Drawings and schedules and by requirements of this section. Each unit shall include fan system, gas heat exchanger, cooling and dehumidifying coil, evaporator coil drain pan, foil-faced thermal insulation, economizer, and any other equipment specified or scheduled, all manufactured by one manufacturer.

B. The single-packaged units shall be a standard product of a firm regularly engaged in the manufacture of heating/cooling equipment.

C. The equipment shall be shipped completely factory assembled, pre-charged, piped, and wired internally ready for field connections.

D. Provide thermal overload protected motors.

E. Manufacturer shall test operate system at the factory before shipment.

F. Unit shall be U.L. listed.

G. All wiring shall be in compliance with Current NEC Codes.

H. Acceptable manufacturers:
1. Carrier, Trane, or equal

2.2 PACKAGED AIR CONDITIONING UNITS – CARRIER VG Series:

A. Cooling System:
1. The total certified cooling capacity shall not be less than scheduled.
2. Units to have two stage scroll compressors with crankcase heaters.
3. The compressor power input shall not exceed that of the unit specified.
4. The coils shall be non-ferrous construction with aluminum fins mechanically bonded to durable copper tubes.
   a. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1,775 psig.
   b. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
5. The compressor shall be resiliently mounted and have built- in, three-mode crankshaft lubrication; crankcase heater; discharge temperature limiter; and current- and temperature- sensing motor overloads.
6. The cooling system shall be protected by high and low pressure switches, filter dryer, oil failure switch, and a five-minute, compressor, timed off cycle controller (anti-

recycle timer), and evaporator coil frostat that shall disable cooling when temperatures on the evaporator coil reach 10 degrees or below. Mechanical cooling will start again when temperatures on the evaporator coil rise to 50 degrees or above.

B. Cabinet:
1. Galvanized steel with a baked-on outdoor enamel paint finish.
2. Cabinet panels where conditioned air is handled shall be fully insulated.
3. Lifting lugs shall be provided for rigging.
4. Unit shall have a raised 1 1/8 inch lip around the supply and return openings.

C. Single-side Service Access:
1. All components, wiring, and inspection areas shall be completely accessible via one side of the unit.

D. Supply Air Blowers:
1. Centrifugal blowers shall be direct drive ECM.
2. The entire assembly shall be resilient rubber mounted.
3. Blower wheel assembly shall be statically and dynamically balanced.
4. Supply blower motors shall be thermally protected and meet the US EPACT 1992 Code.

E. Base unit controls:
1. Unit to be provided with base electromechanical controls.

F. Condenser Fans:
1. Propeller-type condenser fans shall discharge vertically.
2. Fan motor shall be totally enclosed with sleeve bearings, permanently lubricated, thermally protected and equipped with rain shield.
3. Fan shall be protected by a steel guard.

G. Condenser Coil Guard:
1. Factory installed tool-less panel guard shall be manufactured from minimum 20 gauge steel with G90-U corrosion protection.
2. The panel shall be powder coated to match the unit color.
3. Guard open area shall be between fifty percent and sixty percent.

H. Evaporator Coil Drain pan:
1. Drain pan shall be constructed of composite material.

I. Air Filters:
1. Provide two-inch thick, pleated MERV 8, 305%, filters with cardboard holding frames.
2. Air filters shall be of an approved type tested in accordance with test method SFM-31.6 as shown in Article 80, Title 19, California Code of Regulations. Pre-formed filters having combustible framing shall be tested as a complete assembly.
3. Air filters in all occupancies shall be Class 2 or better, as defined in the test method above.
4. Air filters shall be accessible for cleaning or replacement.
5. Provide sufficient filters for a single complete change for each unit.

J. Gas Heat Exchanger:
1. Unless noted otherwise, units shall be complete with gas heating section made up of aluminized steel heat exchanger capable of mixed air temperatures as low as 40 ^{O}F.
2. Where noted on drawings, units shall be complete with gas heating section made up of 304 stainless steel heat exchanger capable of mixed air temperatures as low as 20 ^{O}F.

3. Heat shall be single-stage with intermittent spark electric ignition system and flame sensor.

K. Economizer:
1. Provide dry-bulb 0-100% economizer with barometric relief.
   a. Economizer to be controlled by Controls Contractor and shall have approved fault detection and diagnostic (FDD) approved by CEC.
   b. Economizer to have low leak damper and Belimo Actuator.

L. TXV: Provide factory installed thermal expansion valve (TXV) for each refrigerant circuit.

M. Phase/Voltage Monitor and Protection Device:
1. Provide unit with standard factory installed and tested phase/voltage monitor.
2. Monitor shall have two LED indicator lights. One shall indicate a balanced, three-phase power supply circuit and the other shall indicate that unit operation has been prevented and that the power supply circuit is either not balanced, properly connected or that the line-to-line voltage is not between 180 volts and 633 volts.
3. The monitor shall protect unit from damage if any of the following occur:
   a. If power is lost on one of the three conductors of the three-phase power supply circuit.
   b. If voltage is not sufficiently balanced between the three conductors of the three-phase power supply circuit.
   c. If the three-phase power supply circuit does not have the proper phase sequence.

2.3 PACKAGED AIR CONDITIONING UNITS – CARRIER HC SERIES:

A. Cooling System:
1. The total certified cooling capacity shall not be less than scheduled.
2. The compressor power input shall not exceed that of the unit specified.
3. The coils shall be non-ferrous construction with aluminum fins mechanically bonded to durable copper tubes. Coils shall be leak tested under water with minimum 200 psi air at the factory prior to installation in the units.
4. The compressor shall be resiliently mounted and have built- in, three-mode crankshaft lubrication; crankcase heater; discharge temperature limiter; and current- and temperature- sensing motor overloads.
5. The cooling system shall be protected by high and low pressure switches, filter dryer, oil failure switch, and a five-minute, compressor, timed off cycle controller (anti-recycle timer), and evaporator coil frostat that shall disable cooling when temperatures on the evaporator coil reach 10 degrees or below. Mechanical cooling will start again when temperatures on the evaporator coil rise to 50 degrees or above.

B. Cabinet:
1. Unit cabinet shall be constructed of phosphated, zinc--coated, pre--painted steel capable of with standing 500 hours in salt spray.
2. Normal service shall be through multiple removable cabinet panels.
3. The unit shall be constructed on a rust proof unit base that has an externally trapped, integrated sloped drain.
4. Evaporator fan compartment top surface shall be insulated with a minimum ½ inch thick, 1 ½" density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side.
5. Gas heat compartment shall be insulated with aluminum foil-faced fiberglass insulation.

C. Service Access:

1. All components, wiring, and inspection areas shall be completely accessible through removable access panels.
2. Hinged access panels shall be provided at access to filter section, fan section, compressor section, heat section, and controls.

D. Supply Air Blowers:
1. The evaporator fan motor shall be a multi-speed, belt-drive, as shown on equipment drawings.
2. Supply air blower to be controlled via a factory installed variable frequency drive.
3. Fan wheel shall be made from steel, be double-inlet type with forward curved blades with corrosion resistant finish.
4. Fan wheel shall be dynamically balanced.
5. Supply blower motors shall be thermally protected and meet the US EPACT 1992 Code.
6. Supply blower motors to be high efficiency option.

E. Condenser Fans:
1. Condenser fan shall be direct drive propeller type with aluminum blades riveted to corrosion resistant steel spiders, be dynamically balanced, and discharge air vertically.

F. Condenser Coil Guard:
1. Factory installed guard shall be manufactured from minimum 18 gauge expanded steel.
2. The guards shall be powder coated to match the unit color.
3. Guard open area shall be between fifty percent and sixty percent.

G. Base unit controls:
1. Unit to be provided with base electromechanical controls.

H. Air Filters:
1. Provide two-inch thick, pleated MERV 8, 30%, filters with cardboard holding frames.
2. Air filters shall be of an approved type tested in accordance with test method SFM-31.6 as shown in Article 80, Title 19, California Code of Regulations. Pre-formed filters having combustible framing shall be tested as a complete assembly.
3. Air filters in all occupancies shall be Class 2 or better, as defined in the test method above.
4. Air filters shall be accessible for cleaning or replacement.

I. Economizer:
1. Provide dry-bulb 0-100% economizer with barometric relief.
   a. Economizer to be controlled by Controls Contractor and shall have approved fault detection and diagnostic (FDD) approved by CEC.
   b. Economizer to have low leak damper and Belimo Actuator.

J. Gas Heat Exchanger:
1. Induced-draft combustion type with energy saving direct spark ignition system and redundant main gas valve.
2. Induced-draft motors shall provide adequate airflow for combustion.
3. The heat exchangers shall be constructed of aluminized steel for corrosion resistance.
4. Burners shall be of the in-shot type constructed of aluminum coated steel.
5. All gas piping and electric power shall enter the unit cabinet at a single location.
6. Heat exchanger shall have limited 10 year parts warranty.

K. TXV: Provide factory installed thermal expansion valve (TXV) for each refrigerant circuit.

2.4 PACKAGED AIR CONDITIONING UNITS – CARRIER LC SERIES:

A. Cooling System:
1. The total certified cooling capacity shall not be less than scheduled.
2. Units to have two stage scroll compressors with crankcase heaters, and multi speed ECM condenser fan motors.
3. The compressor power input shall not exceed that of the unit specified.
4. The coils shall be non-ferrous construction with aluminum fins mechanically bonded to durable copper tubes.
   a. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1,775 psig.
   b. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
5. The compressor shall be resiliently mounted and have built- in, three-mode crankshaft lubrication; crankcase heater; discharge temperature limiter; and current- and temperature- sensing motor overloads.
6. The cooling system shall be protected by high and low pressure switches, filter dryer, oil failure switch, and a five-minute, compressor, timed off cycle controller (anti-recycle timer), and evaporator coil frostat that shall disable cooling when temperatures on the evaporator coil reach 10 degrees or below. Mechanical cooling will start again when temperatures on the evaporator coil rise to 50 degrees or above.

B. Cabinet:
1. Galvanized steel with a baked-on outdoor enamel paint finish.
2. Cabinet panels where conditioned air is handled shall be fully insulated.
3. Lifting lugs shall be provided for rigging.
4. Unit shall have a raised 1 1/8 inch lip around the supply and return openings.

C. Single-side Service Access:
1. All components, wiring, and inspection areas shall be completely accessible via one side of the unit through hinged access panels.
2. Hinged access panels shall provide access to filter section.

D. Supply Air Blowers:
1. Centrifugal blowers shall have belt drive motors unless noted otherwise on the Drawings.
2. The entire assembly shall be resilient rubber mounted.
3. Blower wheel assembly shall be statically and dynamically balanced.
4. Supply blower motors shall be thermally protected and meet the US EPACT 1992 Code.

E. Base unit controls:
1. Unit to be provided with base electromechanical controls.

F. Supply Blower Variable Frequency Drive (VFD):
1. Provide variable air volume supply air temperature control with variable frequency drive without bypass where noted on drawings.
2. Unit shall be configured/field programmed for constant volume air delivery.

G. Condenser Fans:
1. Propeller-type condenser fans shall discharge vertically.
2. Fan motor shall be totally enclosed with sleeve bearings, permanently lubricated, thermally protected and equipped with rain shield.
3. Fan shall be protected by a steel guard.

H. Condenser Coil Guard:

1. Factory installed tool-less panel guard shall be manufactured from minimum 20 gauge steel with G90-U corrosion protection.
2. The panel shall be powder coated to match the unit color.
3. Guard open area shall be between fifty percent and sixty percent.

I. Evaporator Coil Drain pan:
1. Drain pan shall be constructed of stainless steel and shall be double-sloped.
2. Unit shall allow for drain on either side and shall have reversible drain pan provided.

J. Air Filters:
1. Provide two-inch thick, pleated MERV 8, 305%, filters with cardboard holding frames.
2. Air filters shall be of an approved type tested in accordance with test method SFM-31.6 as shown in Article 80, Title 19, California Code of Regulations. Pre-formed filters having combustible framing shall be tested as a complete assembly.
3. Air filters in all occupancies shall be Class 2 or better, as defined in the test method above.
4. Air filters shall be accessible for cleaning or replacement.
5. Provide sufficient filters for a single complete change for each unit.

K. Gas Heat Exchanger:
1. Unless noted otherwise, units shall be complete with gas heating section made up of aluminized steel heat exchanger capable of mixed air temperatures as low as 40 ^{O}F.
2. Where noted on drawings, units shall be complete with gas heating section made up of 304 stainless steel heat exchanger capable of mixed air temperatures as low as 20 ^{O}F.
3. Heat shall be single-stage with intermittent spark electric ignition system and flame sensor.

L. Economizer:
1. Provide dry-bulb 0-100% economizer with barometric relief.
   a. Economizer to be controlled by Controls Contractor and shall have approved fault detection and diagnostic (FDD) approved by CEC.
   b. Economizer to have low leak damper and Belimo Actuator.

M. Field installed power exhaust capable of approximately 35% of unit nominal airflow.

N. TXV: Provide factory installed thermal expansion valve (TXV) for each refrigerant circuit.

O. Phase/Voltage Monitor and Protection Device:
1. Provide unit with standard factory installed and tested phase/voltage monitor.
2. Monitor shall have two LED indicator lights. One shall indicate a balanced, three-phase power supply circuit and the other shall indicate that unit operation has been prevented and that the power supply circuit is either not balanced, properly connected or that the line-to-line voltage is not between 180 volts and 633 volts.
3. The monitor shall protect unit from damage if any of the following occur:
   a. If power is lost on one of the three conductors of the three-phase power supply circuit.
   b. If voltage is not sufficiently balanced between the three conductors of the three-phase power supply circuit.
   c. If the three-phase power supply circuit does not have the proper phase sequence.

2.5 EQUIPMENT MOUNTING:

A. Where noted, install new unit on existing curb.

1. Unit shall mate to the bottom perimeter of the equipment. When flashed into the roof, it shall make a unit mounting curb and provide weatherproof duct connection and entry into the conditioned area. Flashing shall be the responsibility of Roofing Contractor.

B. Where noted, provide adaptor roof curb as scheduled and as follows:
1. Furnish and install an adaptor curb as scheduled. Contractor to confirm adaptor curb dimensions prior to ordering and confirm compatibility.
2. Total unit weight and adaptor curb weight shall not exceed scheduled weight.
3. Maximum curb height to be 24".
4. Adaptor curbs shall not be configured such that the unit is rotated on the existing curb.
5. Contractor to field verify existing curb dimensions and, duct configurations prior to submitting on adaptor curbs.

2.6 CONDENSATE DRAINS:

A. Provide type-L, hard-drawn copper tubing with wrought copper solder joint fittings; no iron-to-copper connections; copper fittings with IPS outlets and threaded brass nipples at connections to equipment; di-electric couplings or unions at connections to dissimilar materials

PART 3 EXECUTION

3.1 GENERAL:

A. Examine areas and conditions under which air conditioning units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Warranty:
1. Unit manufacturer shall provide 2 year parts and labor warranty on entire unit including any accessories provided for field installation on the unit.
2. This warranty period shall begin at upon signoff of substantial completion of the project.
3. Unit manufacturer shall provide 5 year compressor parts warranty and limited 10 year heat exchanger parts warranty.

C. Maintenance:
1. Equipment supplier shall perform the scheduled maintenance as detailed in the published maintenance manuals for the packaged air conditioning units for a period of 1 year upon startup of the units.
2. All Preventative maintenance procedures shall be adhered to, including required periodic inspections as prescribed in the manufacturer's published operations and maintenance literature.

3.2 INSTALLATION OF AIR CONDITIONING UNITS:

A. Install air conditioning units where indicated in accordance with equipment manufacturer's written instructions and with recognized industry practices to ensure that units comply with requirements and serve intended purposes.

B. Units shall be configured for constant volume airflow. VFD shall be programmed to deliver constant volume (not single zone VAV).

3.3 TESTING AND STARTUP:

A. Equipment manufacturer's commercial and industrial local service company shall conduct check, test, and start-up of units and shall complete one startup form for each unit listing the refrigerant suction line pressure and temperature, liquid line pressure and temperature, charge in pounds of refrigerant, charge in pounds of refrigerant as required by the unit nameplate, supply blower rpm and supply blower amps drawn. Startup forms shall be submitted to the Architect and Mechanical Engineer for approval upon completion. If necessary, units shall be field charged with refrigerant for proper operation. Startup by installing contractor or others shall not be acceptable.

END OF SECTION 23 74 00

SECTION 26 28 16

OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
   1. Fuses.
   2. Molded case circuit breakers.

B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
   1. Federal Specification (FS):
      FS W-C-375; Circuit Breakers, Molded Case, Branch Circuit and Service.
      FS W-F-870; Fuseholders (for Plug and Enclosed Cartridge Fuses.
   2. Underwriters Laboratories, Inc. (UL):
      UL 248(1-16); Low-Voltage Fuses.
      UL 489; Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
      UL 512; Fuseholders.
   3. National Electrical Manufacturer Association (NEMA):
      NEMA AB 1; Molded Case Circuit Breakers.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
   1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
   2. Describe product operation, equipment and dimensions and indicate features of each component.
   3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
   4. Provide factory certification of trip characteristics for each type and rating of circuit breaker.
   5. Provide current let-through and melting time information for each type and rating of fuses.
   6. Submit Manufacturer's installation instructions.
   7. Complete bill of material listing all components.
   8. Warranty.

1.4 OPERATION AND MAINTENANCE MANUAL

A. Supply operation and maintenance manuals in accordance with the requirements of Section 260010: Basic Electrical Requirements, to include the following:
   1. A detailed explanation of the operation of the system.
   2. Instructions for routine maintenance.
   3. Parts list and part numbers.
   4. Telephone numbers for authorized parts and service distributors.
   5. Final testing reports.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Overcurrent Protective Device components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.

B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.

C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.7 WARRANTY

A. Units and components offered under this Section shall be covered by a 1 year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

1.8 EXTRA MATERIAL

A. Three (3) spare fuses of each size and type or a minimum of 10 percent of the number installed, whichever is greater, shall be supplied to the Owner in the specified spare fuse cabinet(s).

B. Provide and locate a spare fuse cabinet(s) in the main electrical room. Cabinet shall have lockable piano hinged door, keyed to match panelboards, with fuse schedules mounted in a frame on interior. Size and quantity of cabinets shall be as required to accommodate spare fuses required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with

all features specified herein and indicated on the Drawings.

1. Fuses:
   a. Bussmann Division, Cooper Industries.
   b. Gould Shawmut Co.
2. Circuit breakers:
   a. Square D.
   b. Eaton Electrical/Cutler-Hammer.
   c. General Electric.
   d. Siemens/I-T-E.

B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 FUSES

A. General: All power fuses shall be time-delay, high interrupting (300 K AIC), current limiting type, unless otherwise noted on the Drawings. All fuses shall be the product of a single Manufacturer and shall be selectively coordinated when applied in 2:1 ratios. Types of fuses shall be as follows:
   1. 0 - 600 amperes: UL Class J, dual element, time delay type fuse with separate overload and short-circuit elements. The fuse shall hold 500% of rated current for a minimum of 10 seconds.

B. Control and instrument fuses shall be suitable for installing in blocks or fuseholders. Exact type and rating shall be as recommended by the Manufacturer of the equipment being protected.

2.3 MOLDED CASE CIRCUIT BREAKERS

A. Branch and feeder circuit breakers shall be molded case, bolt on and trip indicating. New breakers replacing existing shall be by the same manufacturer and same AIC rating as existing.

B. Where stationary molded case circuit breakers are indicated on the Drawings to be current limiting type, they shall be current limiting as defined by UL 489 and shall not employ any fusible elements.

C. Circuit breakers shall have interrupting capacity not less than that indicated on the Drawings or if not indicated, not less than 14,000 RMS symmetrical amps for 480 volt systems and 10,000 RMS symmetrical amps for 208 volt systems.

D. Covers shall be sealed on non-interchangeable breakers and trip unit covers shall be sealed on interchangeable trip breakers to prevent tampering. Circuit breaker ratings shall be clearly visible after installation or engraved nameplates shall be provided stating the rating. All ferrous parts shall be plated to minimize corrosion.

E. Circuit breakers shall be toggle, quick-make and quick-break operating mechanisms with trip-free feature to prevent contacts being held closed against overcurrent conditions in the circuit. Trip position of the breakers shall be clearly indicated by operating handles moving to a center position.

F. Multipole breakers shall have a single handle to open and close all contacts simultaneously in both manual operation and under automatic tripping. Interpole barriers shall be provided inside the breaker to prevent any phase-to-phase flashover. Each pole of the breaker shall

have means for Arc extinguishing.

G. All terminals shall be rated for aluminum or copper wire.

H. Circuit breakers with trip ratings 100 amp and smaller shall be ambient temperature compensated, thermal magnetic type unless otherwise noted. Breakers shall be of full size, 1" per pole type. Panels with more than one branch breaker larger than 100 amps shall be installed in distribution type panels.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of overcurrent protective device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

A. Install overcurrent protective devices in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.

B. Tighten electrical connectors and terminals; including screws and bolts, in accordance with equipment Manufacturers published torque-tightening values for equipment connectors. Where Manufacturers torque requirements are not indicated tighten connectors and terminals to comply with tightening torque specified in UL Standard 486A.

C. Install overcurrent protective devices and accessories in accordance with Manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. All devices shall be installed in accordance with applicable NEC and NEMA standards for installation.

D. Circuit breakers serving "Fire Alarm Control Panel(s)" shall be red in color.

3.3 FIELD QUALITY CONTROL

A. Prefunctional testing:
   1. Provide Testing Agency with Contract Documents and Manufacturer instructions for installation and testing.
   2. Visual and mechanical inspection:
      a. Inspect for physical damage, defects alignment and fit.
      b. Perform mechanical operational tests in accordance with Manufacturer's instructions.
      c. Compare nameplate information and connections to Contract Documents.
      d. Check tightness of all control and power connections.
      e. Check that all covers, barriers and doors are secure.

B. Contractor shall replace at no costs to the Owner all devices which are found defective or do not operate within factory specified tolerances.

3.4 CLEANING

A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean

overcurrent protective devices per Manufacturer's approved methods and materials. Remove paint splatters and other spots, dirt and debris.

END OF SECTION 26 28 16

SECTION 26 28 19

DISCONNECT SWITCHES

PART 1 GENERAL

1.1 SUMMARY

A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
   1. Disconnect Switches.

B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated on specified:
   1. Federal Specifications (FS):
      FS W-F-870; Fuseholders (for plug and enclosed cartridge fuses).
      FS W-S-865; Switch, Box (enclosed), Surface-Mounted.
   2. National Electrical Manufacturer Association (NEMA):
      NEMA KS 1; Enclosed Switches.
   3. Underwriters Laboratories, Inc. (UL):
      UL 512; Fuseholders.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
   1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
   2. As a minimum the following characteristics shall be indicated:
      a. NEMA types.
      b. Current rating.
      c. Number of poles.
      d. Fuse provisions.
      e. Enclosure dimensions.
      f. Voltage.
      g. Horsepower rating (if applicable).
      h. Short circuit rating.
   3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
   4. Submit Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
   1. Square D.
   2. Eaton Electrical/Cutler-Hammer.
   3. General Electric.
   4. Siemens/I-T-E.

B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 DISCONNECT SWITCHES

A. Description: Provide NEMA heavy-duty type switches with dead front construction and padlock provisions for up to three locks in the “OFF” position.

B. Switch interior: Provide switch with switchblades that are fully visible in the “OFF” position when the door is open. Provide UL listed lugs for copper conductors, lugs to be front removable. Provide plated current carrying part.

C. Switch mechanism: Provide switches with a quick-make, quick-break, position indicating, operating handle and mechanism and a dual cover interlock to prevent unauthorized opening of the switch door in the “ON” position or closing of the switch mechanism with the door open. Furnish an electrical interlock to de-energize control wiring when the disconnect switch is opened.

D. Enclosures: Provide switches with hinged cover in NEMA 1 general purpose, sheet steel enclosure for dry locations and NEMA 3R weatherproof galvanized enclosures for exterior, damp or wet locations, unless otherwise noted on the Drawings. Provide an enclosure treated with a rust-inhibiting phosphate primer and finished in gray baked enamel.

E. Ratings: Provide switches that are horsepower rated for 240 VAC or 600 VAC as required for the circuit involved and that meet “I-SQUARED-T” requirements. Fusible switches to have provisions for the types of fuses specified in Section 262816: Overcurrent Protective Devices. UL listed short circuit rating, when equipped with fuses to be 200,000 amperes RMS symmetrical. Furnish with provisions for RK-1 fuses for switches up to 600 amps. 800 amp switches and larger to have provisions for Class L fuses.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of disconnects switch installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Coordinate locations of switches and equipment in the field to provide code required clearances in front of switches and to ensure that switches are insight of the controller as described in NEC Article 430.

3.3 INSTALLATION

A. Install disconnect switches where indicated on the Drawings.

B. Install fuses in fusible disconnect switches.

C. Include construction channel and mounting hardware as required to support disconnect switch.

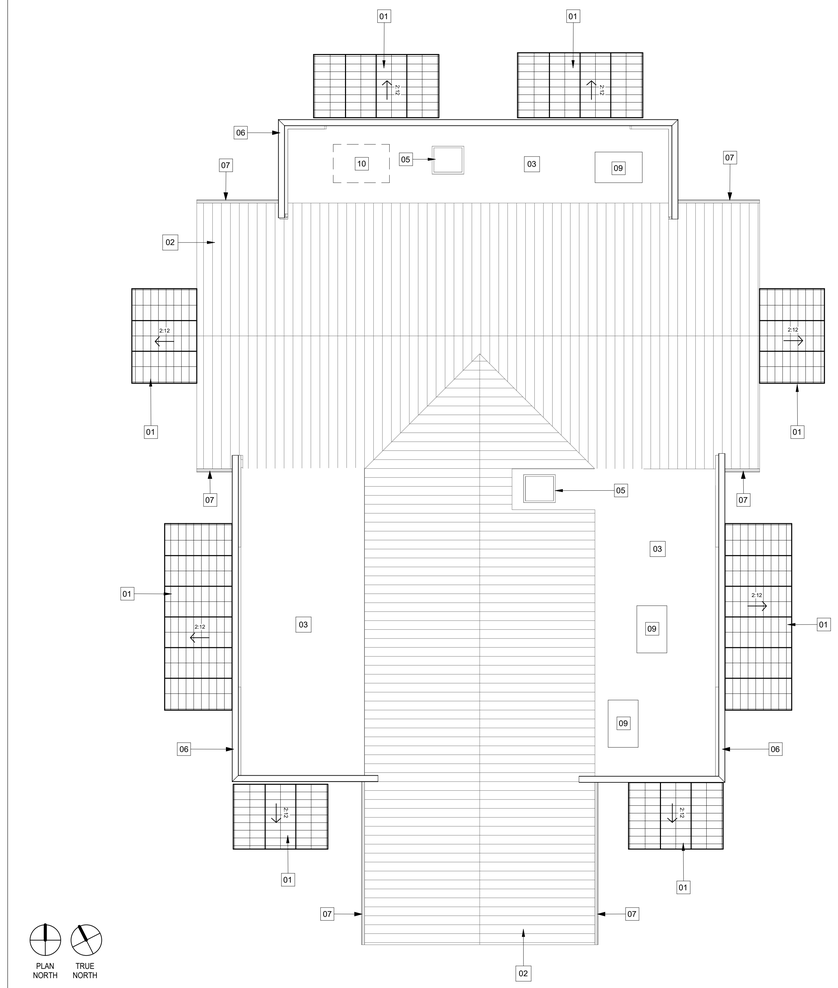
3.4 IDENTIFICATION

A. Provide engraved, machine screw retained type 'NP' nameplate on each disconnect switch. See Section 260553: Electrical Identification.

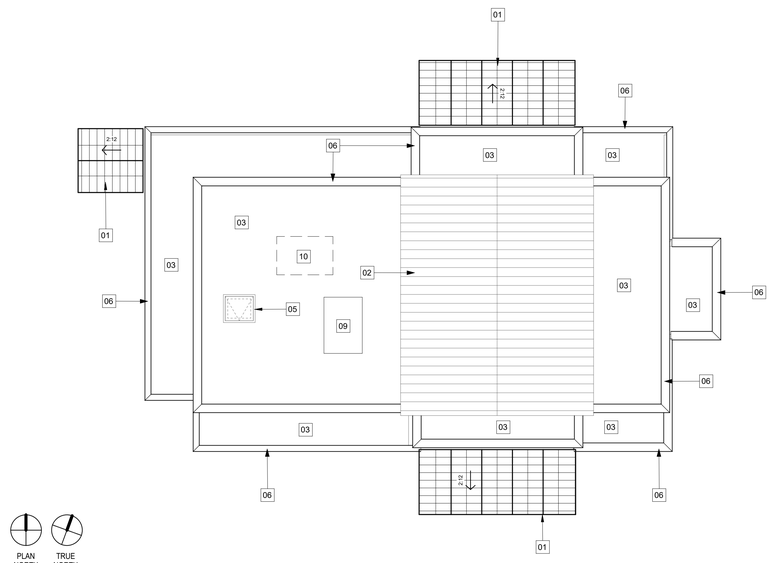
3.5 CLEANING

A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean both the interior and exterior of enclosure of all construction debris, scrap wire, paint splatters, dirt, etc.

END OF SECTION 26 28 19



2 ROOF PLAN - BLDG G
1/8" = 1'-0"



1 ROOF PLAN - BLDG A
1/8" = 1'-0"

GENERAL DEMOLITION NOTES

1. DEMOLITION PLANS INDICATE SOME OF THE SCOPE-OF-WORK INVOLVED FOR THE DEMOLITION PHASE OF THIS PROJECT. CONTRACTOR SHALL REVIEW ALL SHEETS FOR ADDITIONAL DEMOLITION SCOPE.
2. CONTRACTOR SHALL VERIFY EXISTING SITE AND BUILDING CONDITIONS AND DIMENSIONS IN THE FIELD PRIOR TO DEMOLITION ACTIVITIES AND WORK.
3. CONTRACTOR SHALL NOTIFY ARCHITECT OF ANY DISCREPANCIES IN WRITING.
4. CONTRACTOR SHALL NOTIFY ARCHITECT AND OWNER OF ANY POSSIBLE ASBESTOS CONTAINING MATERIALS DISCOVERED BEFORE PROCEEDING WITH WORK, PROTECT INTERIOR CONSTRUCTION TO REMAIN DURING DEMOLITION AND CONSTRUCTION.
5. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS BEFORE COMMENCING WORK.
6. AFTER AWARD OF THE CONTRACT, CHANGE ORDER REQUESTS FOR ADDITIONAL MONEY WILL NOT BE APPROVED IF THE WORK COULD HAVE BEEN ANTICIPATED DURING A SITE VISIT BY THE CONTRACTOR.
7. CONTRACTOR SHALL NOT SCALE DRAWINGS.
8. CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY SHORING, TEMPORARY BRACING, AND OR TEMPORARY SUPPORTS AS REQUIRED TO MAINTAIN STRUCTURAL INTEGRITY OF EXISTING STRUCTURE TO REMAIN AND OR EXISTING BUILDING ELEMENTS TO REMAIN.
9. CONTRACTOR IS TO VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO DEMOLITION ACTIVITIES AND WORK.
10. CONTRACTOR SHALL REMOVE TRASH AND DEBRIS REGULARLY AS NECESSARY TO ELIMINATED INTERFERENCE WITH ROADS, STREET, WALKS, AND ALL OTHER ADJACENT FACILITIES.
11. CONTRACTOR SHALL REMOVE TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.
12. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION OF TEMPORARY DUST AND OR SOUND PARTITION BETWEEN CONSTRUCTION AREA AND AREAS NOT IN SCOPE AS NECESSARY. DEMOLITION ACTIVITIES SHALL BE PERFORMED SO AS TO PRODUCE MINIMAL DISTURBANCE TO EXISTING FACILITY AND OCCUPANTS (I.E. MINIMIZE EXCESSIVE AND PROLONGED NOISE LEVELS AND DUST).
13. CONTRACTOR SHALL REPAIR, REPLACE, OR PATCH EXISTING BUILDINGS, DRIVEWAYS, SIDEWALKS, CANOPIES, AND OR PARKING AREAS DAMAGED, MODIFIED, AND OR DISTURBED BY DEMOLITION WORK AT NO COST TO THE OWNER.
14. ALL EXISTING EQUIPMENT THAT REMAINS SHALL BE PROTECTED DURING DEMOLITION AND OR CONSTRUCITON TO PREVENT DAMAGE. ANY DAMAGE TO REMAINING EXISTING EQUIPMENT SUSTAINED DURING DEMOLITION AND OR CONSTRUCITON SHALL BE EQUIVALENTLY REPLACED OR EQUIVALENTLY REPAIRED AT NO COST TO THE OWNER.
15. CONTRACTOR SHALL PROVIDE TRAFFIC HANDLING MEASURES TO PROTECT THE GENERAL PUBLIC AT ALL TIMES, AS NECESSARY AND AS REQURED BY AUTHORITIES HAVING JURISDICTION.
16. DO NOT INTERRUPT EXISTING UTILITIES, EXCEPT WHEN AUTHORIZED IN WRITING BY AUTHORITIES HAVING JURISDICTION. PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES, AS ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
17. WHEN UTILITY SERVICES ARE REQUIRED TO BE REMOVED, RELOCATED, OR ABANDONED, PROVIDE BYPASS CONNECTIONS TO MAINTAIN CONTINUITY OF SERVICE BEFORE PROCEEDING WITH DEMOLITION.
18. CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES INCLUDING BUT NOT LIMITED TO THE FOLLOWING: ELECTRIC, GAS, WATER, TELEPHONE, STORM SEWER, AND SANITARY SEWER FOR FIELD LOCATION OF ALL UNDERGROUND AND OVERHEAD UTILITY LINES. PRIOR TO COMMENCEMENT OF ANY DEMOLITION WORK, CONTRACTOR SHALL IDENTIFY ALL ELECTRICAL CIRCUITS SERVICING THE AREA INVOLVED WITH THIS DEMOLITION. THOSE CIRCUITS SHALL THEN BE LOCKED OUT AND TAGGED OUT IF THEY DO NOT SERVICE ANY OF THE REMAINING BUILDING. THOSE CIRCUITS WHICH ARE IDENTIFIED TO SERVICE BOTH THE AREA TO BE DEMOLISHED AND THE REMAINING BUILDING SHALL BE SPLIT SO AS TO KILL ALL ELECTRICAL POWER TO THE AREA TO BE DEMOLISHED WHILE MAINTAINING POWER TO THE REMAINDER OF THE BUILDING.
19. CONTRACTOR SHALL RELOCATE UTILITIES AND EQUIPMENT AS REQUIRED TO ACCOMMODATE NEW HVAC, ELECTRICAL, PLUMBING, AND TECHNOLOGY REQUIREMENTS FOR NEW WORK.
20. PROTECT EXISTING SITE ELEMENTS AND EXISTING LANDSCAPING TO REMAIN. PROTECTION SHALL INCLUDE BUT NOT BE LIMITED TO EXISTING TREES AND OTHER EXISTING VEGETATION INDICATED TO REMAIN IN PLACE AGAINST UNNECESSARY CUTTING, BREAKING, OR SKINNING OF ROOTS, SKINNING OR BRUISING OF BARK, SMOTHERING OF TREES BY STOCKPILING CONSTRUCTION MATERIAL OR EXCAVATED MATERIAL WITHIN DRIP LINES.
21. CONTRACTOR SHALL REGRADE AND HYDROMULCH AREAS AFFECTED BY DEMOLITION.
22. OWNER HAS RIGHT OF FIRST REFUSAL OF ALL ITEMS REMOVED AS PART OF THE SOCPE OF WORK, WHETHER IDENTIFIED AS SALVAGE OR NOT.
23. NOTIFY THE BUILDING OWNER OF ANY MATERIALS, FIXTURES, ETC. TO BE REMOVED THAT ARE DEEMED SALVAGEABLE. TURN OVER ANY REQUESTED ITEMS TO THE BUILDING OWNER IN GOOD CONDITION.
24. ALL FURNITURE WILL BE REMOVED OR RELOCATED BY THE OWNER AS NECESSARY PRIOR TO THE DEMOLITION WORK OF THIS PROJECT. CONTRACTOR SHALL COORDINATE WITH OWNER AS REQUIRED.
25. REMOVE EXISTING CONSTRUCTION TO THE EXTENT INDICATED ON THE DRAWINGS. SHOULD ANY DAMAGE OCCUR TO ANY EXISTING CONSTRUCTION TO REMAIN, THE CONTRACTOR SHALL REPAIR THE DAMAGE TO MATCH EXISTING AND OR ADJACENT CONSTRUCTION AT NO COST TO THE OWNER.
26. MAINTAIN ANY AND ALL EXISTING FIRE-RATED ASSEMBLIES THAT ARE TO REMAIN, AND THEIR ASSOCIATED FIRE-RATINGS, INCLUDING BUT NOT LIMITED TO ALL ASSOCIATED EXISTING FIRE-RATED OPENINGS, ALL ASSOCIATED EXISTING FIRE-RATED PENETRATIONS, AND ALL ASSOCIATED EXISTING FIRE-RATED FIRESTOPPING CONDITIONS.
27. WHEN UNANTICIPATED MECHANICAL, ELECTRICAL, OR STRUCTURAL ELEMENTS THAT CONFLICT WITH THE INTENDED FUNCTION OR DESIGN ARE ENCOUNTERED, DETERMINE THE NATURE AND EXTENT OF THE CONFLICT AND NOTIFY THE ARCHITECT IMMEDIATELY FOR RESOLUTION.
28. REMOVE, PATCH, AND REPAIR ALL ABANDONED ROOF PENETRATIONS RESULTING FROM WORK.
29. SAW-CUT AND REMOVE EXISTING FLOOR FINISHES AND FLOOR SLAB AS REQUIRED TO INSTALL NEW FIXTURES, ITEMS, AND OR DEVISES FOR ALL SCOPE-OF-WORK PERTAINING TO NEW MECHANICAL WORK, NEW PLUMBING UTILITIES, NEW PLUMBING WORK, NEW ELECTRICAL WORK, AND NEW TECHNOLOGY WORK. SPLICE NEW REINFORCING BARS DOWELLED INTO EXITISTING CONCRETE AND PROVIDE NEW VAPOR RETARDER AND NEW CONTINUOUS WATERSTOPS AT JOINT BETWEEN NEW CONCRETE FLOOR SLAB AND EXISTING CONCRETE FLOOR SLAB. PATCH WITH NEW 3,500 PSI MINIMUM CONCRETE AND PREPARE FLOOR, INCLUDING NEW CONCRETE, TO RECEIVE NEW FLOOR FINISHES. COORDINATE WITH STRUCTURAL.
30. EXISTING WALLS (OR PORTIONS OF WALLS) TO BE REMOVED SHALL BE CUT FLUSH WHERE INTERSECTING WITH WALLS TO REMAIN. REMAINING WALLS TO BE PATCHED AND FINISHED SMOOTH.
31. NEW OPENING TO BE CUT IN EXISTING WALLS SHALL BE SAW-CUT AT LOCATIONS INDICATED TO THE HEIGHT AND WIDTH INDICATED. NEW LINTELS SHALL BE INSTALLED TO SUPPORT EXISTING WALL CONSTRUCTION ABOVE AS INDICATED ON THE DRAWINGS, OR IF NOT INDICATED, AS REQUIRED FOR NEW WALL CONSTRUCTION PER STRUCTURAL DRAWINGS. COORDINATE LOCATIONS OF ALL NEW OPENINGS IN EXISTING WALLS AND PARTITIONS WITH ARCHITECTURAL PLANS.
32. WHERE EXISTING WALL OPENINGS ARE TO BE NEWLY CLOSED-OFF, REMOVE ANY EXISTING OPENING FRAME AND PATCH AND REPAIR EXISTING WALL TO MATCH EXISTING ADJACENT MATERIALS AND FINISHES, U.N.O.
33. WHERE EXISTING INTERIOR WALLS ARE REPLACED OR REMOVED, REMOVE MEPT SYSTEMS BACK TO PANEL, OR MECHANICAL ROOM, OR FARTHEST POSSIBLE POINT WITHOUT DISTURBING EXISTING CONSTRUCTION. REMOVE EXISTING MECHANICAL EQUIPMENT, RELOCATE POWER PER MEPT DRAWINGS.
34. REFER TO MEPT DRAWINGS FOR DEMOLITION OF MEPT SYSTEMS. IDENTIFY WORK REQUIRED BY THIS CONTRACTOR WHICH MAY AFFECT DEMOLITION AND OR REPAIRS OF ARCHITECTURAL ELEMENTS. COORDINATE WITH RELATED SUB CONTRACTORS THE EXTENT OF ALL DEMOLITION WORK.
35. PATCH FLOORS, WALLS CEILINGS WHICH REMAIN AT LOCATIONS WHERE PIPES, CONDUITS, ETC. ARE REMOVED AS REQUIRED TO MATCH EXISTING CONDITIONS OR TO RECEIVE NEW FINISHES.
36. WHERE EXISTING FINISH FLOOR IS REMOVED, PREPARE FLOOR SURFACE TO RECEIVE NEW FLOORING.
37. ALL DASHED LINES ARE DEMOLITION LINES UNLESS NOTED OTHERWISE.

KEY NOTES

01	(E) CANOPY TO REMAIN
02	(E) METAL ROOFING TO REMAIN
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08	(E) ROOF LADDER TO REMAIN
09	(E) HVAC UNIT TO REMAIN
10	(E) HVAC UNIT TO BE DEMOLISHED

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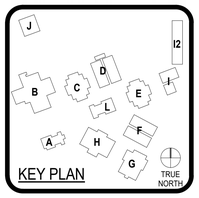
MARENGO RANCH ELEMENTARY SCHOOL
ADDENDUM #1 - HVAC REPLACEMENT

1000 ELK HILS DRIVE, GALT, CA 95632

ADDEDUM #01
PTN: 67348-15

Building a Bright Future for All Learners
Galt Joint Union Elementary School District



PTN: 67348-15
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APPL. 02-116660
ACS _____ FLS _____ SS _____
DATE _____

LICENSED PROFESSIONAL

CLIENT
GALT JOINT UNION ELEMENTARY SCHOOL DISTRICT

PROJECT NUMBER 17233
DATE: 08/03/2018
DRAWN BY: Author
CHECKED BY: Checker

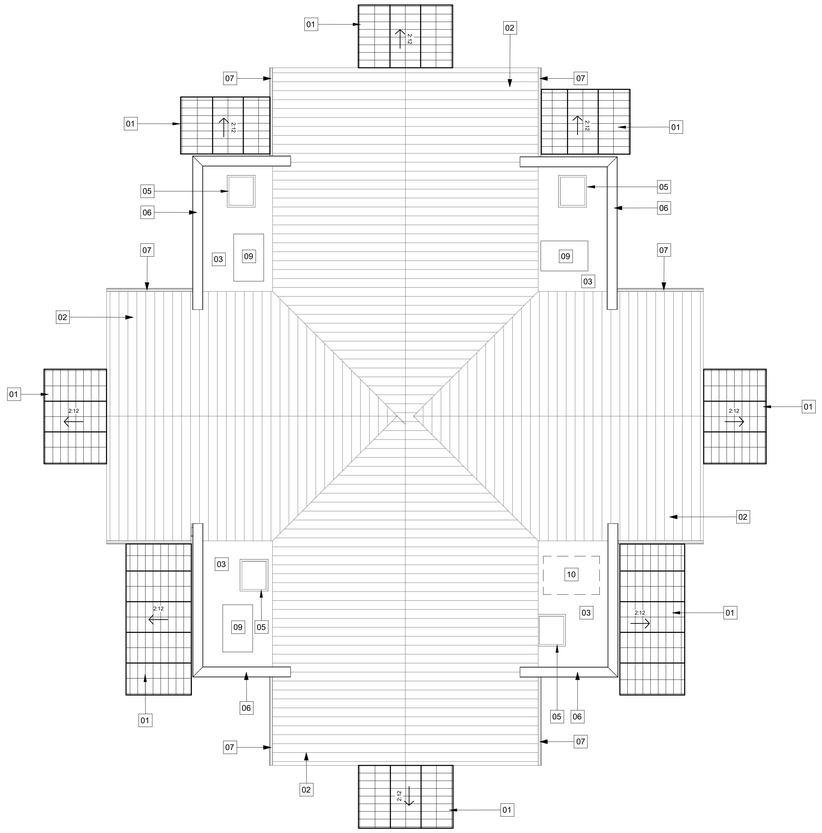
REVISIONS

No.	Description	Date

ADDEDUM #01

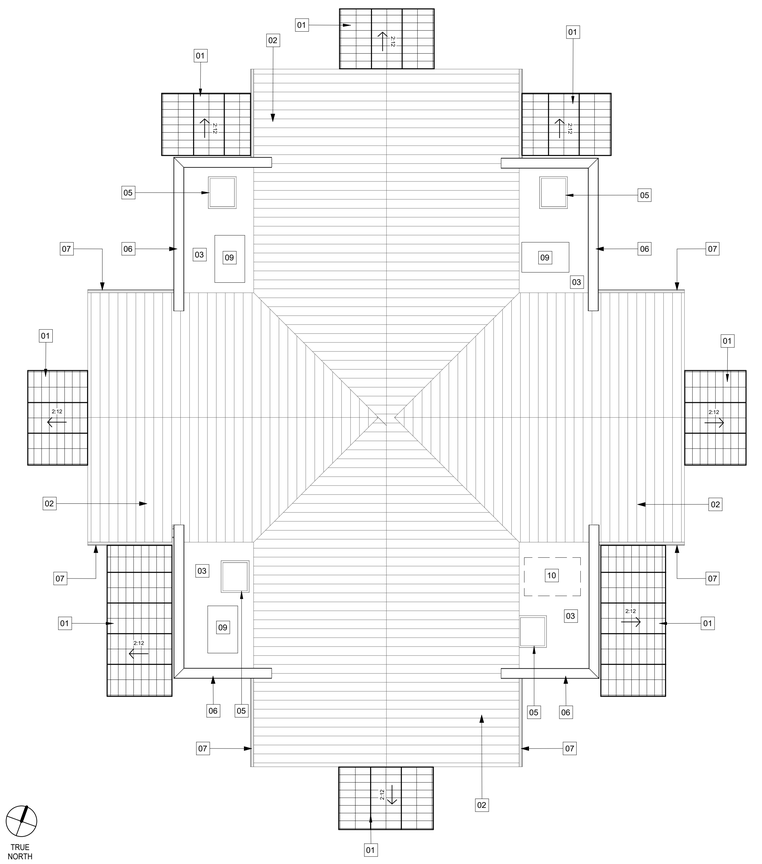
DEMOLITION ROOF PLANS - BLDG A & G

SK-01



PLAN NORTH | TRUE NORTH

2 ROOF PLAN - BLDG E
1/8" = 1'-0"



PLAN NORTH | TRUE NORTH

1 ROOF PLAN - BLDG C
1/8" = 1'-0"

GENERAL DEMOLITION NOTES

1. DEMOLITION PLANS INDICATE SOME OF THE SCOPE-OF-WORK INVOLVED FOR THE DEMOLITION PHASE OF THIS PROJECT. CONTRACTOR SHALL REVIEW ALL SHEETS FOR ADDITIONAL DEMOLITION SCOPE.
2. CONTRACTOR SHALL VERIFY EXISTING SITE AND BUILDING CONDITIONS AND DIMENSIONS IN THE FIELD PRIOR TO DEMOLITION ACTIVITIES AND WORK.
3. CONTRACTOR SHALL NOTIFY ARCHITECT OF ANY DISCREPANCIES IN WRITING.
4. CONTRACTOR SHALL NOTIFY ARCHITECT AND OWNER OF ANY POSSIBLE ASBESTOS CONTAINING MATERIALS DISCOVERED BEFORE PROCEEDING WITH WORK, PROTECT INTERIOR CONSTRUCTION TO REMAIN DURING DEMOLITION AND CONSTRUCTION.
5. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS BEFORE COMMENCING WORK.
6. AFTER AWARD OF THE CONTRACT, CHANGE ORDER REQUESTS FOR ADDITIONAL MONEY WILL NOT BE APPROVED IF THE WORK COULD HAVE BEEN ANTICIPATED DURING A SITE VISIT BY THE CONTRACTOR.
7. CONTRACTOR SHALL NOT SCALE DRAWINGS.
8. CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY SHORING, TEMPORARY BRACING, AND OR TEMPORARY SUPPORTS AS REQUIRED TO MAINTAIN STRUCTURAL INTEGRITY OF EXISTING STRUCTURE TO REMAIN AND OR EXISTING BUILDING ELEMENTS TO REMAIN.
9. CONTRACTOR IS TO VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO DEMOLITION ACTIVITIES AND WORK.
10. CONTRACTOR SHALL REMOVE TRASH AND DEBRIS REGULARLY AS NECESSARY TO ELIMINATED INTERFERENCE WITH ROADS, STREET, WALKS, AND ALL OTHER ADJACENT FACILITIES.
11. CONTRACTOR SHALL REMOVE TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.
12. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION OF TEMPORARY DUST AND OR SOUND PARTITION BETWEEN CONSTRUCTION AREA AND AREAS NOT IN SCOPE AS NECESSARY. DEMOLITION ACTIVITIES SHALL BE PERFORMED SO AS TO PRODUCE MINIMAL DISTURBANCE TO EXISTING FACILITY AND OCCUPANTS (I.E. MINIMIZE EXCESSIVE AND PROLONGED NOISE LEVELS AND DUST).
13. CONTRACTOR SHALL REPAIR, REPLACE, OR PATCH EXISTING BUILDINGS, DRIVEWAYS, SIDEWALKS, CANOPIES, AND OR PARKING AREAS DAMAGED, MODIFIED, AND OR DISTURBED BY DEMOLITION WORK AT NO COST TO THE OWNER.
14. ALL EXISTING EQUIPMENT THAT REMAINS SHALL BE PROTECTED DURING DEMOLITION AND OR CONSTRUCITON TO PREVENT DAMAGE. ANY DAMAGE TO REMAINING EXISTING EQUIPMENT SUSTAINED DURING DEMOLITION AND OR CONSTRUCITON SHALL BE EQUIVALENTLY REPLACED OR EQUIVALENTLY REPAIRED AT NO COST TO THE OWNER.
15. CONTRACTOR SHALL PROVIDE TRAFFIC HANDLING MEASURES TO PROTECT THE GENERAL PUBLIC AT ALL TIMES, AS NECESSARY AND AS REQURED BY AUTHORITIES HAVING JURISDICTION.
16. DO NOT INTERRUPT EXISTING UTILITIES, EXCEPT WHEN AUTHORIZED IN WRITING BY AUTHORITIES HAVING JURISDICTION. PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES, AS ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
17. WHEN UTILITY SERVICES ARE REQUIRED TO BE REMOVED, RELOCATED, OR ABANDONED, PROVIDE BYPASS CONNECTIONS TO MAINTAIN CONTINUITY OF SERVICE BEFORE PROCEEDING WITH DEMOLITION.
18. CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES INCLUDING BUT NOT LIMITED TO THE FOLLOWING: ELECTRIC, GAS, WATER, TELEPHONE, STORM SEWER, AND SANITARY SEWER FOR FIELD LOCATION OF ALL UNDERGROUND AND OVERHEAD UTILITY LINES. PRIOR TO COMMENCEMENT OF ANY DEMOLITION WORK, CONTRACTOR SHALL IDENTIFY ALL ELECTRICAL CIRCUITS SERVICING THE AREA INVOLVED WITH THIS DEMOLITION. THOSE CIRCUITS SHALL THEN BE LOCKED OUT AND TAGGED OUT IF THEY DO NOT SERVICE ANY OF THE REMAINING BUILDING. THOSE CIRCUITS WHICH ARE IDENTIFIED TO SERVICE BOTH THE AREA TO BE DEMOLISHED AND THE REMAINING BUILDING SHALL BE SPLIT SO AS TO KILL ALL ELECTRICAL POWER TO THE AREA TO BE DEMOLISHED WHILE MAINTAINING POWER TO THE REMAINDER OF THE BUILDING.
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02	(E) METAL ROOFING TO REMAIN
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08	(E) ROOF LADDER TO REMAIN
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10	(E) HVAC UNIT TO BE DEMOLISHED

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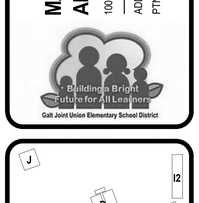
MARENGO RANCH ELEMENTARY SCHOOL
ADDENDUM #1 - HVAC REPLACEMENT

1000 ELK HILS DRIVE, GALT, CA 95632

ADDEDUM #01
PTN: 67348-15

Building a Bright Future for All Learners
Galt Joint Union Elementary School District



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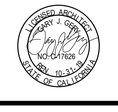


CLIENT
GALT JOINT UNION ELEMENTARY SCHOOL DISTRICT

PROJECT NUMBER
17233

DATE: 08/03/2018
DRAWN BY: Author
CHECKED BY: Checker

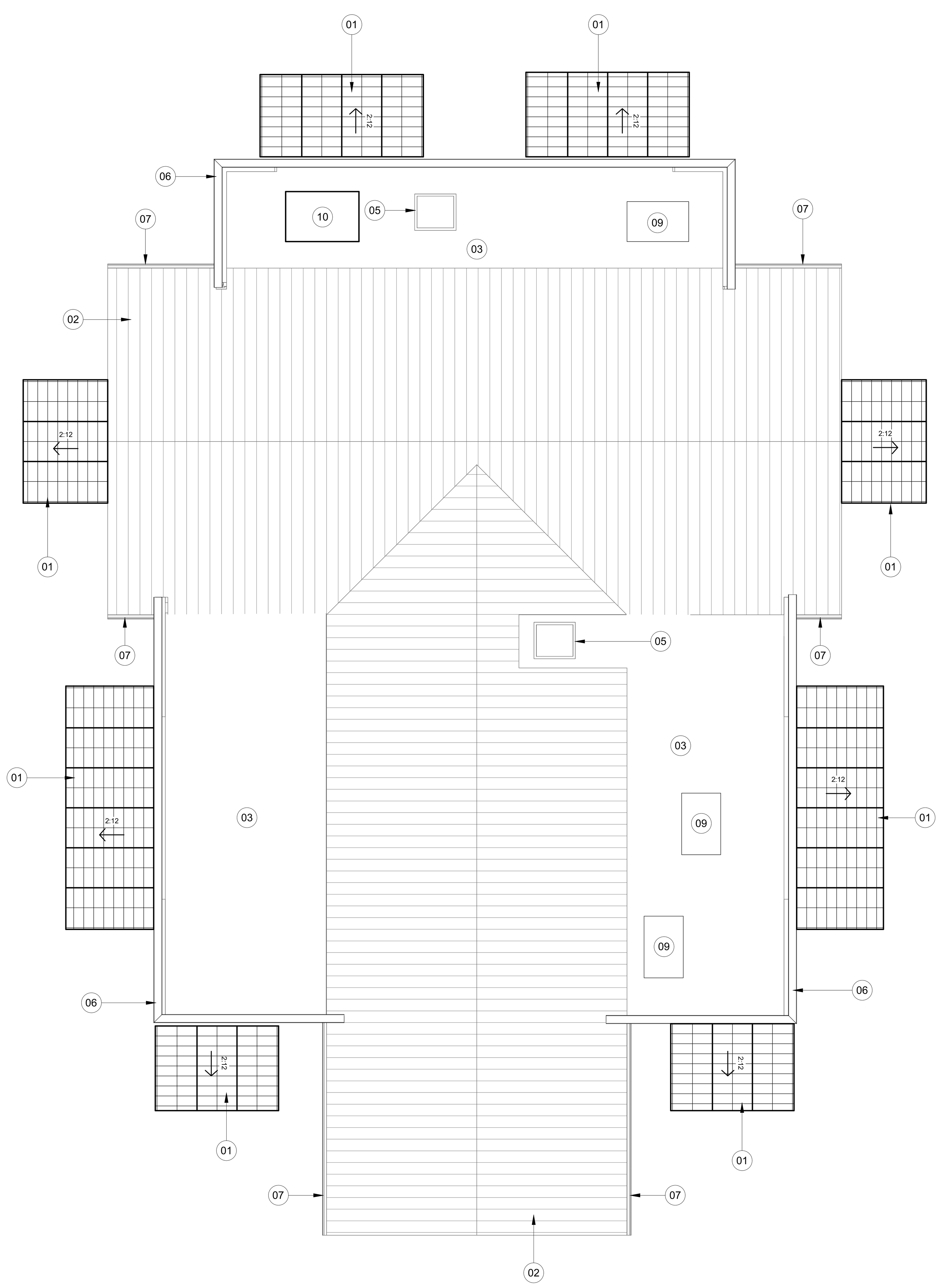
REVISIONS

No.	Description	Date

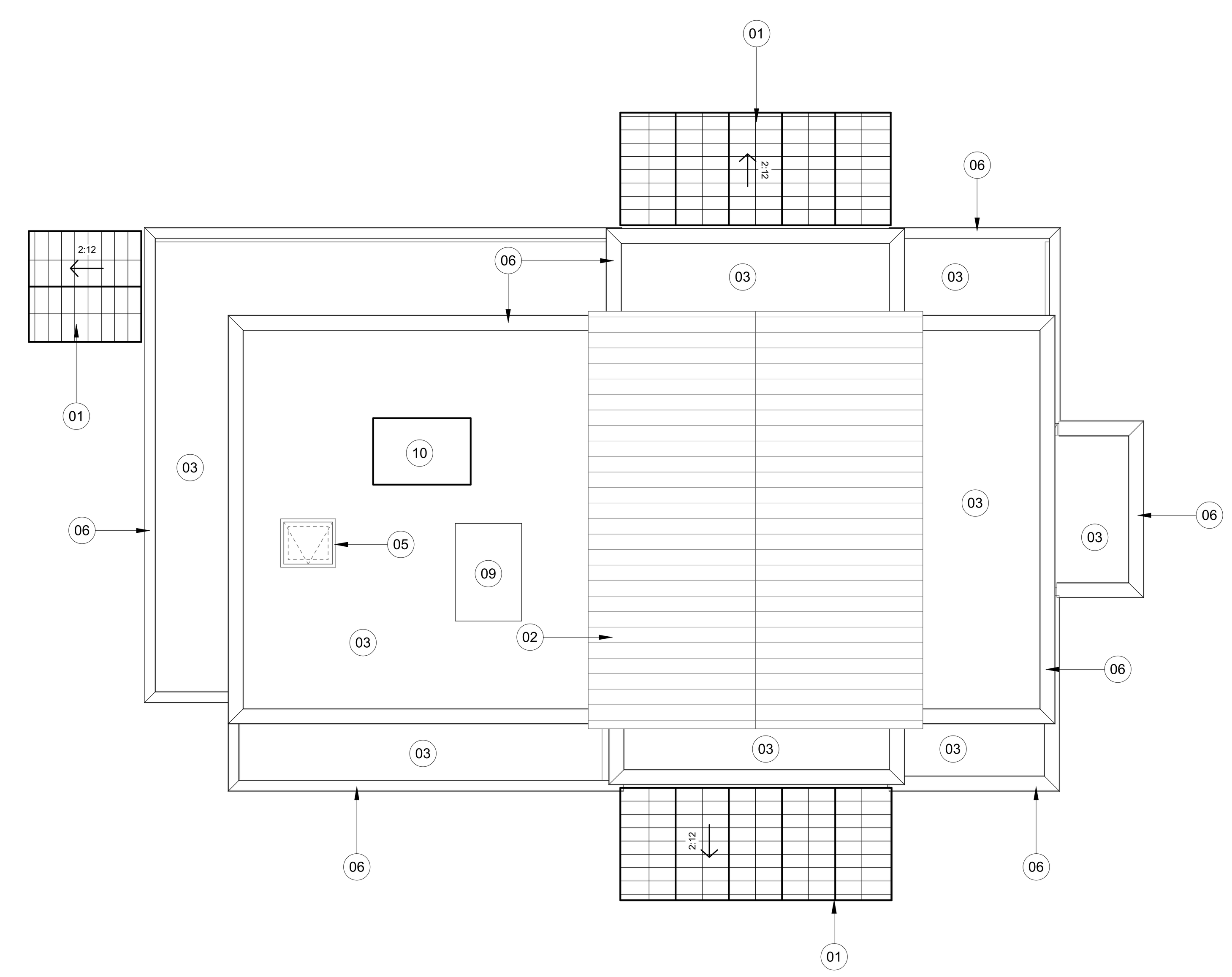
ADDEDUM #01

DEMOLITION ROOF PLANS - BLDG C & E

SK-02



2 ROOF PLAN - BLDG G
1/8" = 1'-0"



1 ROOF PLAN - BLDG A
1/8" = 1'-0"

GENERAL NOTES

1. ALL AREAS IDENTIFIED IN THESE DRAWINGS ARE BASED ON INITIAL SITE WALK OF EXISTING SURFACE CONDITIONS. THERE MAY BE ADDITIONAL AREAS WHERE REPAIRS ARE RECOMMENDED AND/OR NEEDED. IF UPON CLOSER INSPECTION THERE ARE ADDITIONAL AREAS REQUIREING REPAIRS, CONTRACTOR TO VERIFY THE AREAS OF CONCERN AND THEIR CONDITION AND REPAIR AS NECESSARY. CONTRACTOR TO NOTIFY ARCHITECT IF AREAS INVOLVING STRUCTURAL REPAIRS ARE FOUND.
2. CONTRACTOR TO VERIFY ALL EXISTING HVAC UNITS ARE PROPERLY ANCHORED AND FASTENED PER THE MANUFACTURER'S RECOMMENDED SPECIFCATIONS.

KEYNOTES

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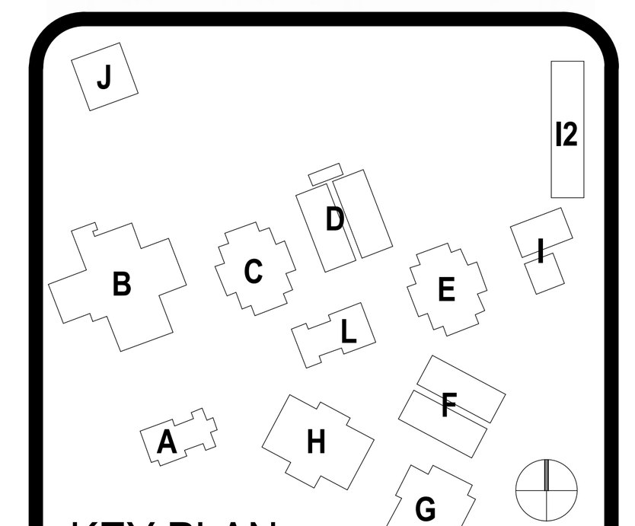

KEY PLAN

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LICENSED PROFESSIONAL
LICENSED ARCHITECT
GARY J. GIBSON
NO. C-17626
REN. 10-31-19
STATE OF CALIFORNIA

CLIENT
GALT JOINT UNION ELEMENTARY SCHOOL DISTRICT

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CHECKED BY:	Checker
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ADDEDUM #01

ROOF PLANS - BLDGS A & G

SK-03

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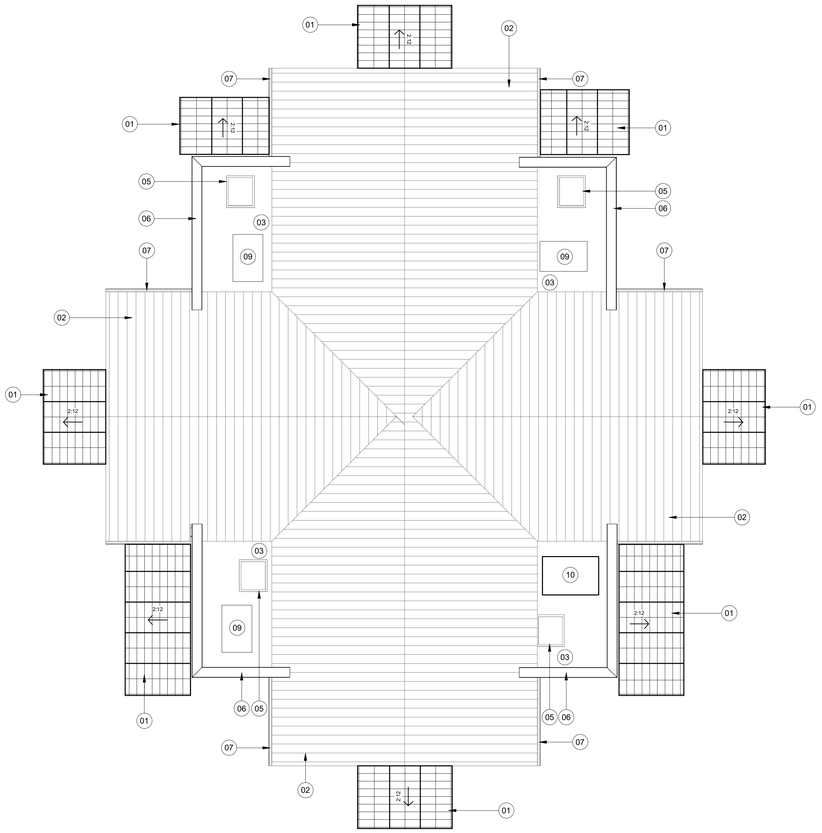
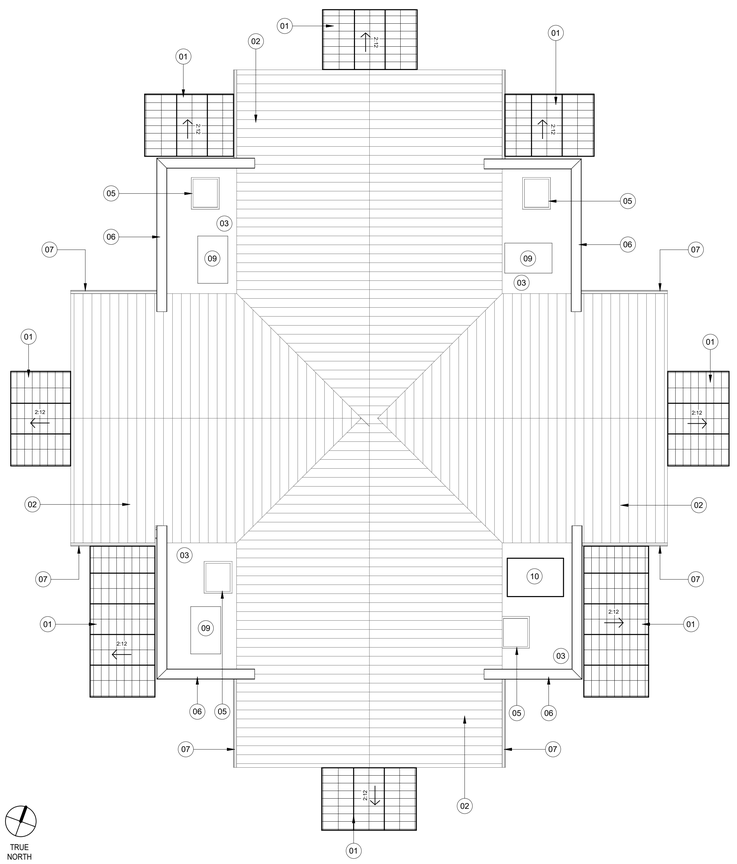


PLAN NORTH TRUE NORTH

2 ROOF PLAN - BLDG E
1/8" = 1'-0"



PLAN NORTH TRUE NORTH

1 ROOF PLAN - BLDG C
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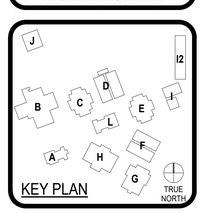
Galt Joint Union Elementary School District



PTN: 67348-15
FILE NO. 34-25
IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APPL. 02-116660
ACS _____ FLS _____ SS _____
DATE _____

LICENSED PROFESSIONAL

CLIENT
GALT JOINT UNION ELEMENTARY SCHOOL DISTRICT

PROJECT NUMBER
17233

DATE: 08/03/2018
DRAWN BY: Author
CHECKED BY: Checker

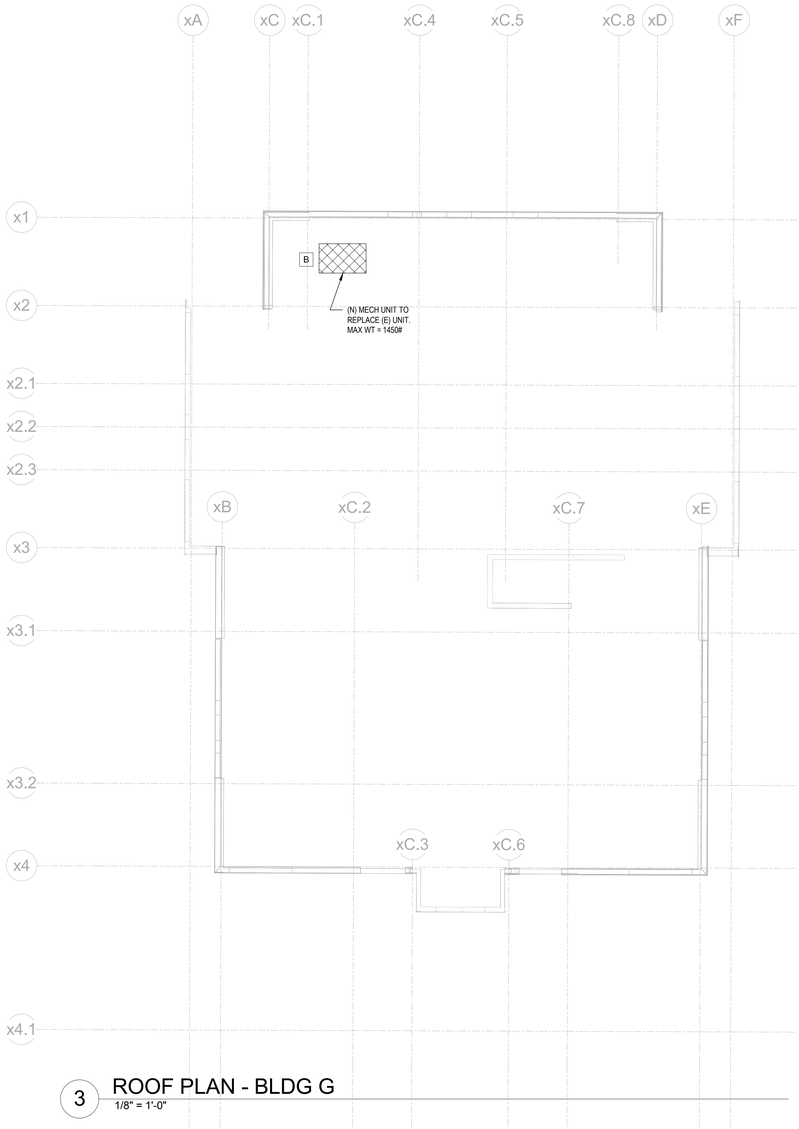
REVISIONS

No.	Description	Date

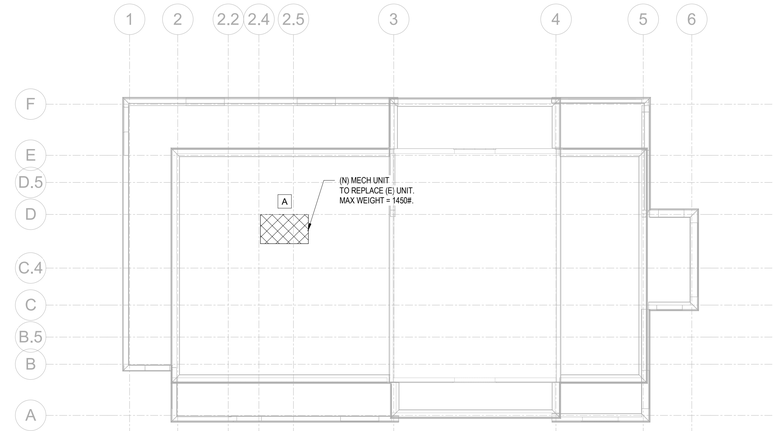
ADDEDUM #01

ROOF PLANS - BLDGS C & E

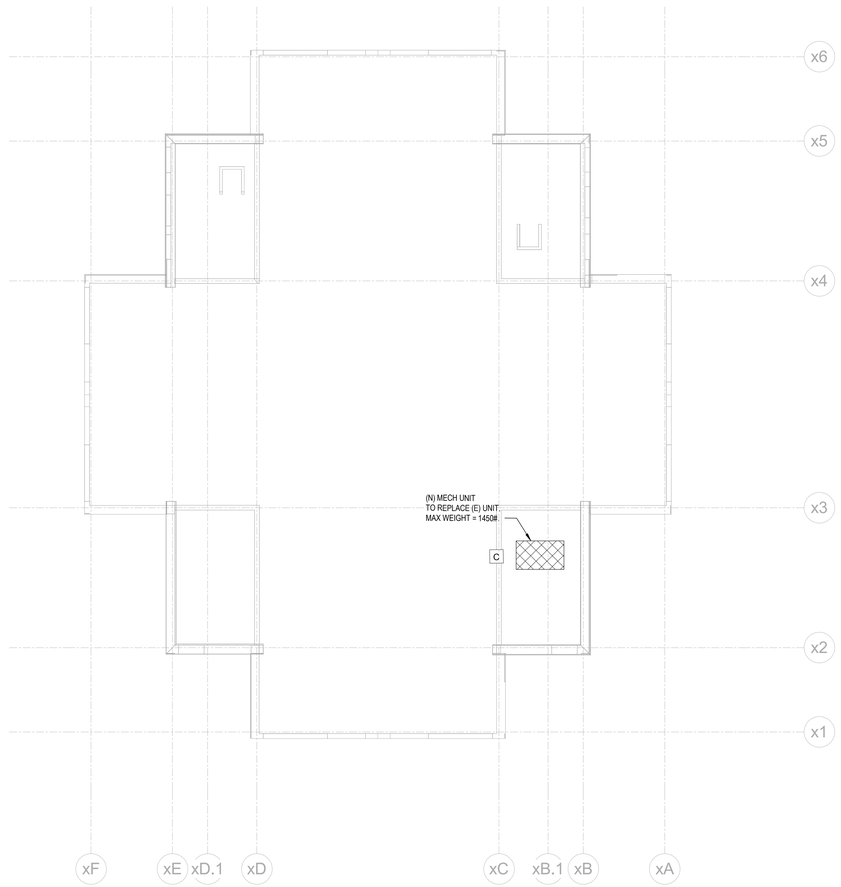
SK-04



3 ROOF PLAN - BLDG G
1/8" = 1'-0"



1 ROOF PLAN - BLDG A
1/8" = 1'-0"



2 ROOF PLAN - BLDG C & E
1/8" = 1'-0"

ROOF FRAMING PLAN NOTES

1. SEE SHEET S1.0 FOR STRUCTURAL GENERAL NOTES.
2. VERIFY/OBTAIN ALL DIMENSIONS FROM THE ARCHITECTURAL DRAWINGS.
3. PROVIDE AND COORDINATE OPENINGS FOR MECHANICAL WORK AS REQUIRED.
4. INDICATES (E) WALL BELOW.
4. INDICATES (E) WALL ABOVE.
5. A INDICATES ANCHORAGE PER 1/SK-S2
   B INDICATES ANCHORAGE PER 2/SK-S2
   C INDICATES ANCHORAGE PER 3/SK-S2

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916-482-0800 P WESTON-ME.COM

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530-886-8556 P ENGINT.COM

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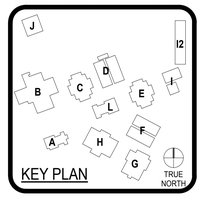
ROSEVILLE, CA 95661
916-772-7688 P KPFF.COM

MARENGO RANCH ELEMENTARY SCHOOL
ADDENDUM # 1 - HVAC REPLACEMENT
1000 ELK HILS DRIVE, GALT, CA 95632

CONSTRUCTION DOCUMENTS
PTN: 67348-15

Building a Bright Future for All Learners
Galt Joint Union Elementary School District



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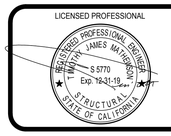
LICENSED PROFESSIONAL



CLIENT
GALT JOINT UNION ELEMENTARY SCHOOL DISTRICT

PROJECT NUMBER
1700-304

DATE:	08/28/2018
DRAWN BY:	HM
CHECKED BY:	RM

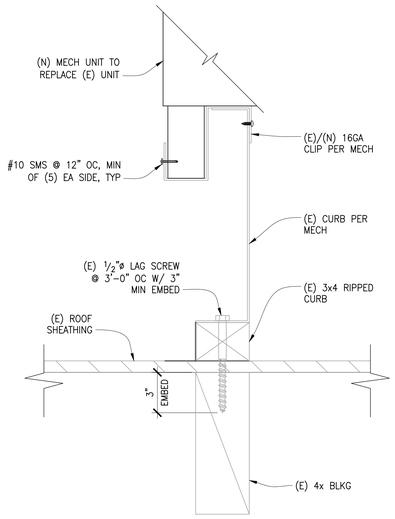
REVISIONS

No.	Description	Date

CONSTRUCTION DOCUMENTS

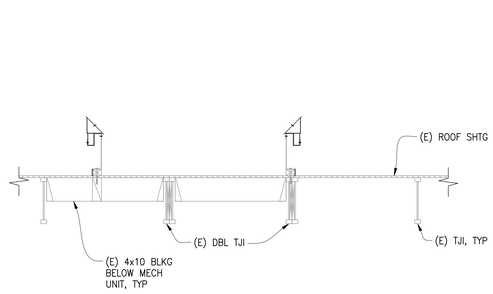
BLDG A, C, E & G ROOF FRAMING PLAN

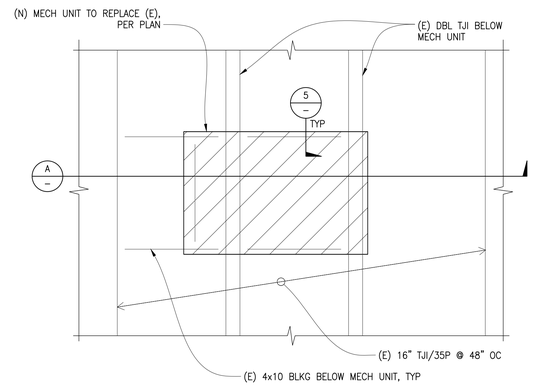
SK-S1



MECHANICAL UNIT SUPPORT FRAMING

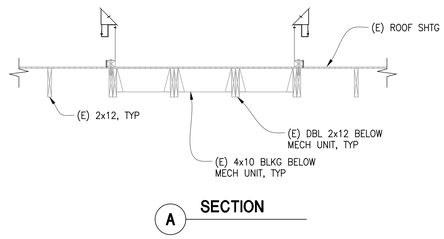
3"=1'-0" | 5

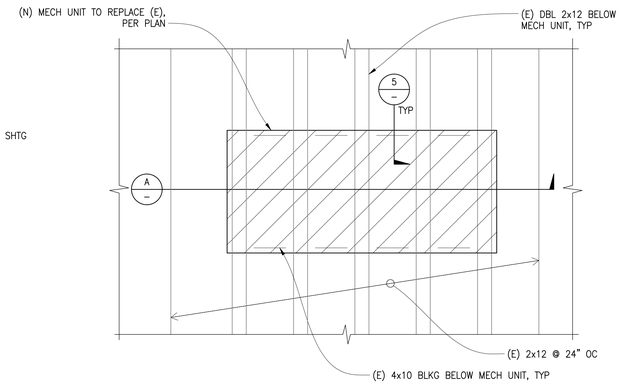




MECHANICAL UNIT SUPPORT TYPE A

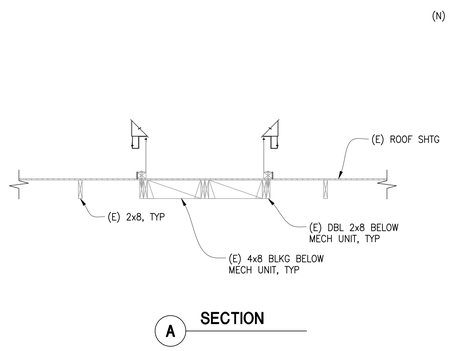
½"=1'-0" | 1

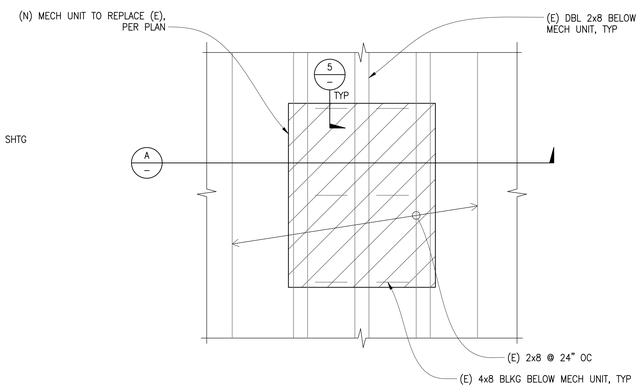




MECHANICAL UNIT SUPPORT TYPE B

½"=1'-0" | 2





MECHANICAL UNIT SUPPORT TYPE C

½"=1'-0" | 3

NOT USED

½"=1'-0" | 4

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MARENGO RANCH ELEMENTARY SCHOOL
ADDENDUM #1 - HVAC REPLACEMENT
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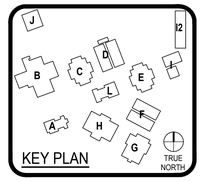
CONSTRUCTION DOCUMENTS
PTN: 67348-15

Building a Bright Future for All Learners
Galt Joint Union Elementary School District



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ENGINEER
REGISTERED PROFESSIONAL ENGINEER JAMES MATHISON S 5770 EXP. 12-31-19 STRUCTURAL STATE OF CALIFORNIA

CLIENT

PROJECT NUMBER 1700-304
DATE: 08/28/18
DRAWN BY: HM
CHECKED BY: EF
REVISIONS

No.	Description	Date

CONSTRUCTION DOCUMENTS

DETAILS

SK-S2

AIR CONDITIONING UNIT SCHEDULE

(N) EQUIPMENT ID	(E) UNIT ID (FROM RECORD DWGS	PREVIOUS DSA #	"CARRIER" MODEL NUMBER	NOMINAL TONNAGE	SUPPLY AIR BLOWER					MINIMUM COOLING CAPACITY (MBH @ ARI CONDITIONS)		HEATING CAPACITY (MBH)		MINIMUM SEER / (EER)	UNIT ELECTRICAL DATA					MIRCROMETL ADAPTOR CURB MODEL #	MIRCROMETL POWER EXHAUST MODEL #	POWER EXHAUST ELECTRICAL DATA					MINIMUM OUTSIDE AIR (CFM)	(E) INSTALLED UNIT WEIGHT (LBS.)	(N) INSTALLED UNIT WEIGHT (LBS.)	NOTES
					DESIGN CFM	NOMINAL CFM	HP	bHP	ESP	(GROSS) TOTAL	(NET) SENSIBLE	INPUT	OUTPUT		VOLTS	PHASE	HERTZ	MCA	MOCP			VOLTS	PHASE	HERTZ	FLA	HP				
AC A2	AC A2	95-62934	CARRIER WEATHEREXPERT 48HCDD07A2A6-0A0G0	6 TON	2,400	2,400	1.11	1.11	0.6	70.54	54.93	50/72	41/59	(12.0)	460	3	60	16	20	CA-CAR-597-CAR-537	PECD-SRT12CA-D2DH-4MH	460	3	60	1.9	1/2	210	1120	1405	(N) UNIT BASE WEIGHT = 780 LBS, (E) CURB = 130 LBS, (N) ADAPT A CURB = 227 LBS, (N) POWER EXHAUST/ACCESSORIES = 267 LBS. WEIGHT DIFFERENCE = 285 LBS. | 25% HIGHER
AC C3	AC C3	95-62934	CARRIER WEATHEREXPERT 48HCDD07A2A6-0A0G0	6 TON	2,400	2,400	1.11	1.11	0.6	70.54	54.93	50/72	41/59	(12.0)	460	3	60	16	20	CA-CAR-597-CAR-537	PECD-SRT12CA-D2DH-4MH	460	3	60	1.9	1/2	450	1120	1405	(N) UNIT BASE WEIGHT = 780 LBS, (E) CURB = 130 LBS, (N) ADAPT A CURB = 227 LBS, (N) POWER EXHAUST/ACCESSORIES = 267 LBS. WEIGHT DIFFERENCE = 285 LBS. | 25% HIGHER
AC C2	AC D2	95-62934	48HCDD07A2A6-0A0G0	6 TON	2,400	2,400	1.11	1.11	0.6	70.54	54.93	50/72	41/59	(12.0)	460	3	60	16	20	CA-CAR-597-CAR-537	PECD-SRT12CA-D2DH-4MH	460	3	60	1.9	1/2	450	1120	1405	(N) UNIT BASE WEIGHT = 780 LBS, (E) CURB = 130 LBS, (N) ADAPT A CURB = 227 LBS, (N) POWER EXHAUST/ACCESSORIES = 267 LBS. WEIGHT DIFFERENCE = 285 LBS. | 25% HIGHER
AC E2	AC E2	95-62934	CARRIER WEATHEREXPERT 48HCDD07A2A6-0A0G0	6 TON	2,400	2,400	1.11	1.11	0.6	70.54	54.93	50/72	41/59	(12.0)	460	3	60	16	20	CA-CAR-597-CAR-537	PECD-SRT12CA-D2DH-4MH	460	3	60	1.9	1/2	450	1120	1405	(N) UNIT BASE WEIGHT = 780 LBS, (E) CURB = 130 LBS, (N) ADAPT A CURB = 227 LBS, (N) POWER EXHAUST/ACCESSORIES = 267 LBS. WEIGHT DIFFERENCE = 285 LBS. | 25% HIGHER

NOTES:

1. DATA ON EXISTING UNITS SHOWN FOR INFORMATION ONLY.
2. COOLING CAPACITIES ARE LISTED AT NOMINAL CFM (400 CFM/TON) AT ARI CONDITIONS – 95°F AMBIENT, 80°F DB / 67°F WB. REFERENCE FLOORPLANS FOR ACTUAL DESIGN CFM AND BALANCE ACCORDINGLY.
3. UNLESS NOTED OTHERWISE, PROVIDE ALL UNITS WITH THE FOLLOWING MANUFACTURER'S OPTIONS / ACCESSORIES:
   - COIL GUARDS
   - HINGED ACCESS PANELS
   - 2" FILTERS (MERV 8 PLEATED FILTERS)
   - FOIL FACED INSULATION
   - 0-100% DRY BULB ECONOMIZER
   - BASE ELECTROMECHANICAL CONTROLS
   - ULTRA LOW LEAK ECONOMIZER WITH POWER EXHAUST AND BELIMO ACTUATOR (FOR CONTROL BY BMS) FOR FOUR TON AND HIGHER UNITS.
4. LISTED OPERATING WEIGHT INCLUDES EXISTING CURB WEIGHT, NEW UNIT WEIGHT, NEW ADAPTOR CURB WEIGHT (IF APPLICABLE), AND ALL NEW ACCESSORIES.
5. LISTED UNIT MCA/MOCP IS ONLY FOR THE CARRIER AC UNIT AND DOES NOT INCLUDE POWER EXHAUST AMPERAGE.
6. LISTED (E) INSTALLED UNIT WEIGHT IS LISTED UNIT WEIGHT FROM DSA APPROVED RECORD DRAWINGS.
7. LISTED (N) INSTALLED UNIT WEIGHT IS WEIGHT OF NEW UNIT AND ALL ACCESSORIES INCLUDING: (E) CURB, NEW UNIT, ADAPTOR CURB (AS MAY BE NECESSARY), AND NEW UNIT ACCESSORIES.
8. CARRIER MODEL LC SERIES COOLING LOAD LISTED AT SECOND STAGE COOLING.
9. AUTOMATIC SMOKE SHUT OFF NOTES:
   - AC UNITS AC/C3, AC/C4, AC/E1, E2, F1, AND F2 ARE ALL IN EXCESS OF 2,000 CFM; HOWEVER, THESE UNITS MEET THE CMC 608.1, EXCEPTION (2). THESE UNITS SERVE AREAS WHICH HAVE DIRECT ACCESS TO THE EXTERIOR WITH A TRAVEL DISTANCE LESS THAN 100 FEET.
   - AC UNIT AC/E3 TO BE PROVIDED WITH DUCT SMOKE DETECTOR WITHIN SUPPLY AIR DUCT (IF EXISTING IS NOT ALREADY INSTALLED). WIRE DUCT SMOKE DETECTOR TO SHUT DOWN UNIT UPON DETECTION OF SMOKE.

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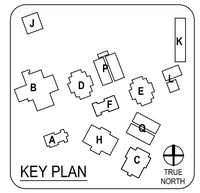
REGISTERED PROFESSIONAL ENGINEER
ADAM C. DAVIS
M 34089
MECHANICAL
STATE OF CALIFORNIA

MARENGO RANCH ELEMENTARY SCHOOL ADDEMDUM #1- HVAC REPLACMENT

1000 ELK HILLS DRIVE, GALT, CA 95632

CONSTRUCTION DOCUMENT
PTN: 67348-15

Building a Bright Future for All Learners
Galt Joint Union Elementary School District



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Other

Architect

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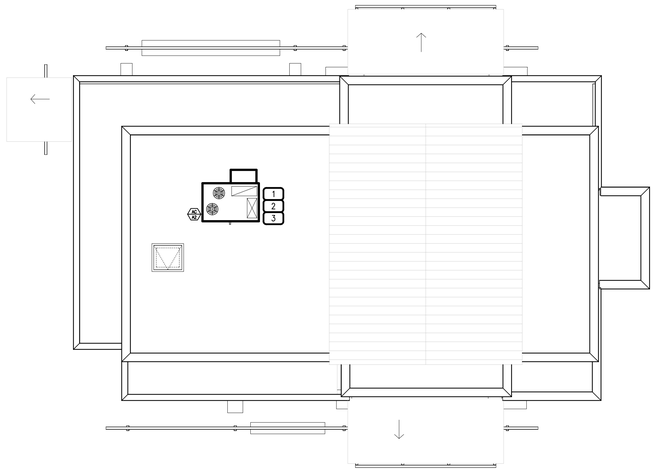
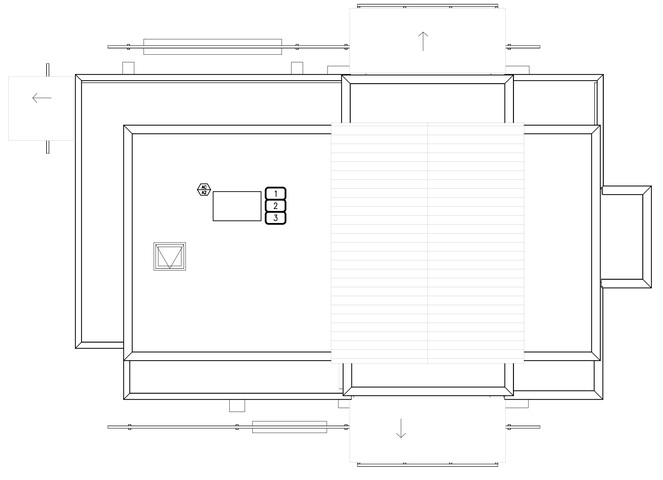
-

HVAC SCHEDULES

SK-M1



21 HVAC ROOF PLAN A
1/8" = 1'-0"



3 HVAC DEMO ROOF PLAN A
1/8" = 1'-0"

SHEET NOTES

1	(E) AC UNIT TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. REMOVE (E) DDC CONTROLS FROM UNIT & PROVIDE NEW CONTROLS ON NEW UNIT. INSTALL NEW UNIT ON EXISTING CURB. PROVIDE ADAPTOR CURB IF SCHEDULED. RECONNECT (E) CD AND GAS TO NEW UNIT – MODIFY/EXTEND TO NEW POCs AS REQUIRED.
2	DISCONNECT (E) GAS FROM UNIT. RECONNECT TO NEW UNIT. EXTEND AS REQUIRED. REPLACE (E) SOV WITH NEW. SEE DETAILS FOR ADDITIONAL DETAILS/NOTES.
3	DISCONNECT (E) CD FROM UNIT. PROVIDE NEW TRAP AND RECONNECT TO PIPING WITHIN THE CURB
4	REMOVE/REPLACE (E) RELIEF VENT. FIELD VERIFY SIZE PRIOR TO ORDERING. RE-INSTALL ON EXISTING CURB.
5	(E) EF TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. INSTALL NEW UNIT ON (E) CURB – PROVIDE WITH CURB ADAPTOR.
6	(E) MAU UNIT TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. REMOVE (E) DDC CONTROLS FROM UNIT & PROVIDE NEW CONTROLS ON NEW UNIT. INSTALL NEW UNIT ON EXISTING CURB. PROVIDE ADAPTOR CURB. RECONNECT (E) WATER, (E) DRAIN AND (E) GAS TO NEW UNIT – MODIFY/EXTEND TO NEW POCs AS REQUIRED. ROUTE 3/4" CONDENSATE TO NEAREST ROOF DRAIN.

KEYED NOTES ABOVE MAY NOT APPLY TO EACH SHEET. SEE SHEETS FOR KEYED NOTE REFERENCES. GENERAL NOTES BELOW APPLY TO EVERY SHEET.

GENERAL NOTES:

1. FIELD VERIFY EXACT PIPE ROUTING AND ADJUST ACCORDINGLY
2. FIELD VERIFY EXACT PIPE SIZE AND ADJUST ACCORDINGLY.
3. CD AND GAS PIPING TO BE REMOVED/REINSTALLED AS REQUIRED TO INSTALL (N) ROOFING. PROVIDE NEW SUPPORTS FOR ALL GAS & CD PIPING.
4. CONTRACTOR TO PAINT ALL GAS PIPING INCLUDING: EXISTING PREVIOUSLY PAINTED AND UNPAINTED GAS PIPING AND ALL NEW GAS PIPING. FIELD VERIFY EXTENT OF EXISTING UNPAINTED PIPING.
5. REMOVE (E) ALERTON CONTROLLERS FROM THE AC UNITS AND THEN REINSTALL AND INTEGRATE CONTROLLER TO (N) UNITS.
6. AFTER UNIT IS REMOVED AND PRIOR TO INSTALLING NEW AC UNIT AND/OR EXHAUST FAN, CONTRACTOR TO VACUUM SUPPLY, RETURN, AND EXHAUST AIR PLENUMS WITHIN LINE OF SIGHT FROM THE ROOF WITH HEPA VACUUM.

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REGISTERED PROFESSIONAL ENGINEER
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M 34869
MECHANICAL
STATE OF CALIFORNIA

MARENGO RANCH ELEMENTARY SCHOOL ADDEDMDUM #1- HVAC REPLACMENT

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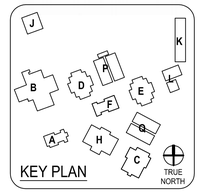

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Architect

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-

HVAC
ROOF PLANS
BLDG A

SK-M2

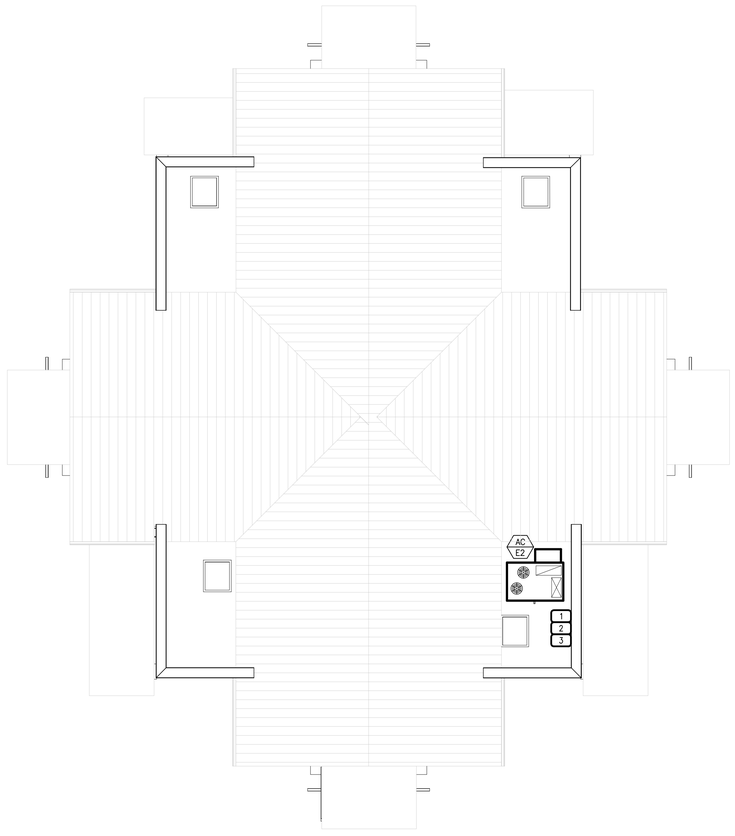
SHEET NOTES

1	(E) AC UNIT TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. REMOVE (E) DDC CONTROLS FROM UNIT & PROVIDE NEW CONTROLS ON NEW UNIT. INSTALL NEW UNIT ON EXISTING CURB. PROVIDE ADAPTOR CURB IF SCHEDULED. RECONNECT (E) CD AND GAS TO NEW UNIT – MODIFY/EXTEND TO NEW POCs AS REQUIRED.
2	DISCONNECT (E) GAS FROM UNIT. RECONNECT TO NEW UNIT. EXTEND AS REQUIRED. REPLACE (E) SOV WITH NEW. SEE DETAILS FOR ADDITIONAL DETAILS/NOTES.
3	DISCONNECT (E) CD FROM UNIT. PROVIDE NEW TRAP AND RECONNECT TO PIPING WITHIN THE CURB
4	REMOVE/REPLACE (E) RELIEF VENT. FIELD VERIFY SIZE PRIOR TO ORDERING. RE-INSTALL ON EXISTING CURB.
5	(E) EF TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. INSTALL NEW UNIT ON (E) CURB – PROVIDE WITH CURB ADAPTOR.
6	(E) MAU UNIT TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. REMOVE (E) DDC CONTROLS FROM UNIT & PROVIDE NEW CONTROLS ON NEW UNIT. INSTALL NEW UNIT ON EXISTING CURB. PROVIDE ADAPTOR CURB. RECONNECT (E) WATER, (E) DRAIN AND (E) GAS TO NEW UNIT – MODIFY/EXTEND TO NEW POCs AS REQUIRED. ROUTE 3/4" CONDENSATE TO NEAREST ROOF DRAIN.

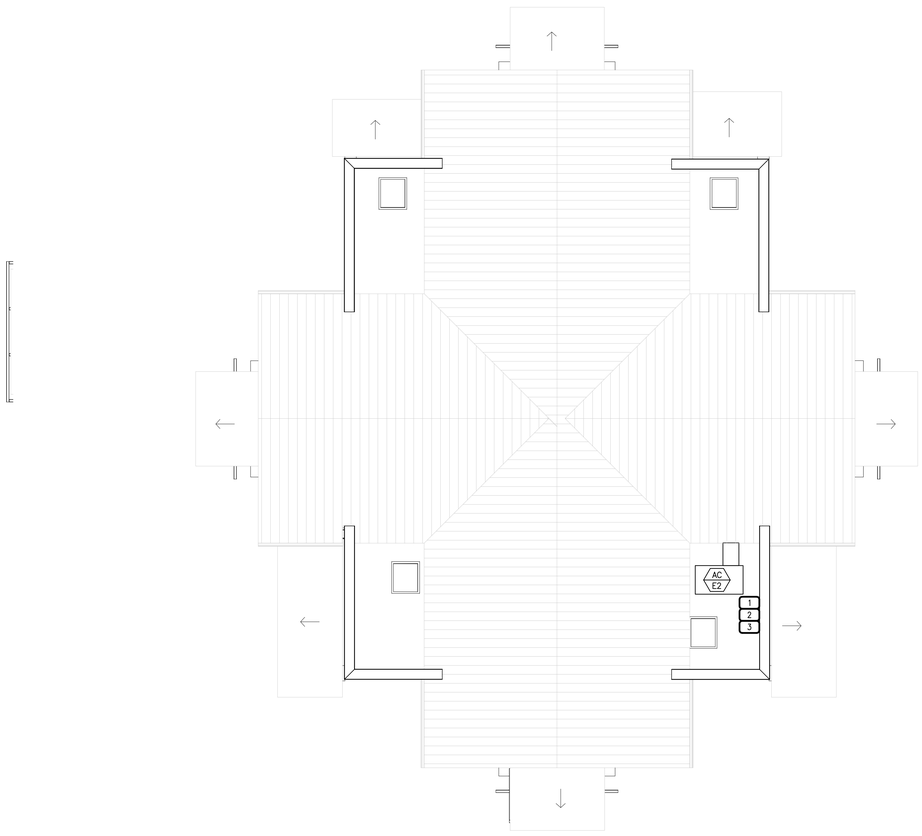
KEYED NOTES ABOVE MAY NOT APPLY TO EACH SHEET. SEE SHEETS FOR KEYED NOTE REFERENCES. GENERAL NOTES BELOW APPLY TO EVERY SHEET.

GENERAL NOTES:

1. FIELD VERIFY EXACT PIPE ROUTING AND ADJUST ACCORDINGLY
2. FIELD VERIFY EXACT PIPE SIZE AND ADJUST ACCORDINGLY.
3. CD AND GAS PIPING TO BE REMOVED/REINSTALLED AS REQUIRED TO INSTALL (N) ROOFING. PROVIDE NEW SUPPORTS FOR ALL GAS & CD PIPING.
4. CONTRACTOR TO PAINT ALL GAS PIPING INCLUDING: EXISTING PREVIOUSLY PAINTED AND UNPAINTED GAS PIPING AND ALL NEW GAS PIPING. FIELD VERIFY EXTENT OF EXISTING UNPAINTED PIPING.
5. REMOVE (E) ALERTON CONTROLLERS FROM THE AC UNITS AND THEN REINSTALL AND INTEGRATE CONTROLLER TO (N) UNITS.
6. AFTER UNIT IS REMOVED AND PRIOR TO INSTALLING NEW AC UNIT AND/OR EXHAUST FAN, CONTRACTOR TO VACUUM SUPPLY, RETURN, AND EXHAUST AIR PLENUMS WITHIN LINE OF SIGHT FROM THE ROOF WITH HEPA VACUUM.



6 HVAC ROOF PLAN BLDG E
1/8" = 1'-0"



3 HVAC DEMO ROOF PLAN BLDG E
1/8" = 1'-0"

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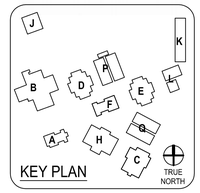
STATE OF CALIFORNIA

MARENGO RANCH ELEMENTARY SCHOOL ADDEDMUM #1- HVAC REPLACMENT

1000 ELK HILLS DRIVE, GALT, CA 95632

CONSTRUCTION DOCUMENT
PTN: 67348-15

Building a Bright Future for All Learners
Galt Joint Union Elementary School District



KEY PLAN

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GALT JOINT UNION ELEMENTARY SCHOOL DISTRICT

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HVAC
ROOF PLANS
BLDG E

SK-M3

SHEET NOTES

1	(E) AC UNIT TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. REMOVE (E) DDC CONTROLS FROM UNIT & PROVIDE NEW CONTROLS ON NEW UNIT. INSTALL NEW UNIT ON EXISTING CURB. PROVIDE ADAPTOR CURB IF SCHEDULED. RECONNECT (E) CD AND GAS TO NEW UNIT – MODIFY/EXTEND TO NEW POCs AS REQUIRED.
2	DISCONNECT (E) GAS FROM UNIT. RECONNECT TO NEW UNIT. EXTEND AS REQUIRED. REPLACE (E) SOV WITH NEW. SEE DETAILS FOR ADDITIONAL DETAILS/NOTES.
3	DISCONNECT (E) CD FROM UNIT. PROVIDE NEW TRAP AND RECONNECT TO PIPING WITHIN THE CURB
4	REMOVE/REPLACE (E) RELIEF VENT. FIELD VERIFY SIZE PRIOR TO ORDERING. RE-INSTALL ON EXISTING CURB.
5	(E) EF TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. INSTALL NEW UNIT ON (E) CURB – PROVIDE WITH CURB ADAPTOR.
6	(E) MAU UNIT TO BE REMOVED/REPLACED (ON EXISTING CURB). REMOVE UNIT / RETAIN EXISTING CURB. REMOVE (E) DDC CONTROLS FROM UNIT & PROVIDE NEW CONTROLS ON NEW UNIT. INSTALL NEW UNIT ON EXISTING CURB. PROVIDE ADAPTOR CURB. RECONNECT (E) WATER, (E) DRAIN AND (E) GAS TO NEW UNIT – MODIFY/EXTEND TO NEW POCs AS REQUIRED. ROUTE 3/4" CONDENSATE TO NEAREST ROOF DRAIN.

KEYED NOTES ABOVE MAY NOT APPLY TO EACH SHEET. SEE SHEETS FOR KEYED NOTE REFERENCES. GENERAL NOTES BELOW APPLY TO EVERY SHEET.

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1. FIELD VERIFY EXACT PIPE ROUTING AND ADJUST ACCORDINGLY
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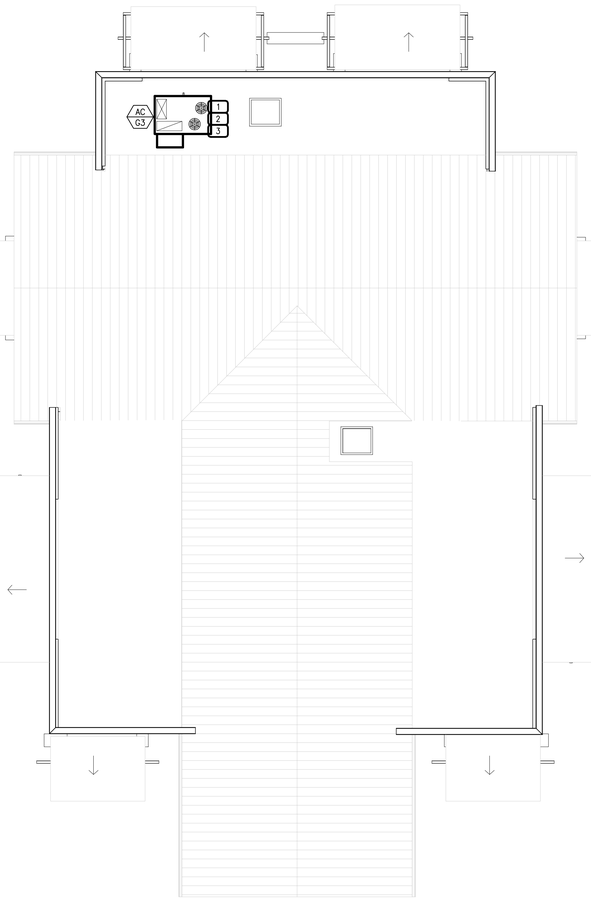

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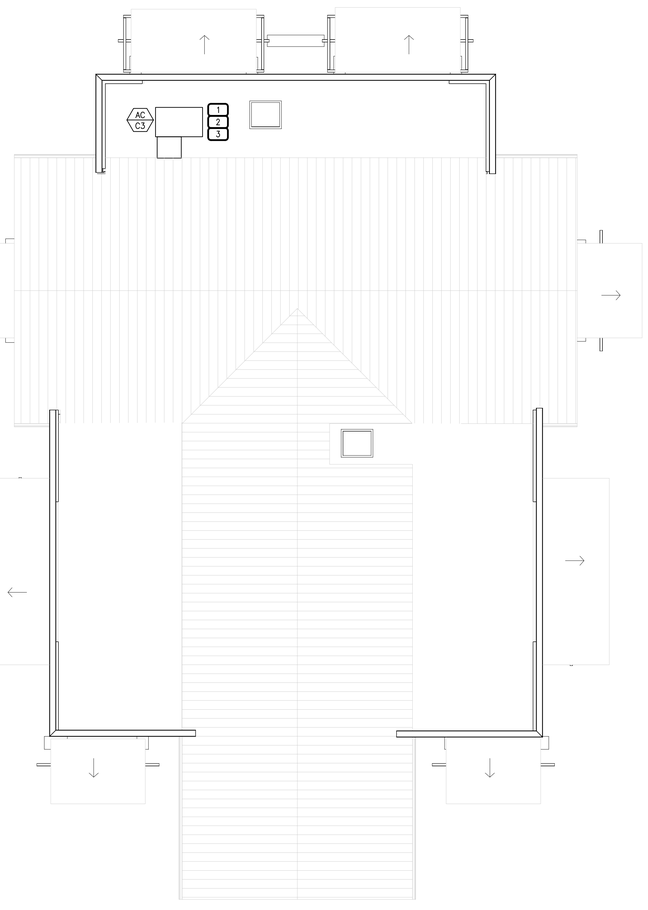
1/8" = 1'-0"



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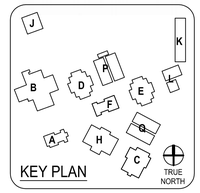

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HVAC
ROOF PLANS
BLDG G

SK-M4

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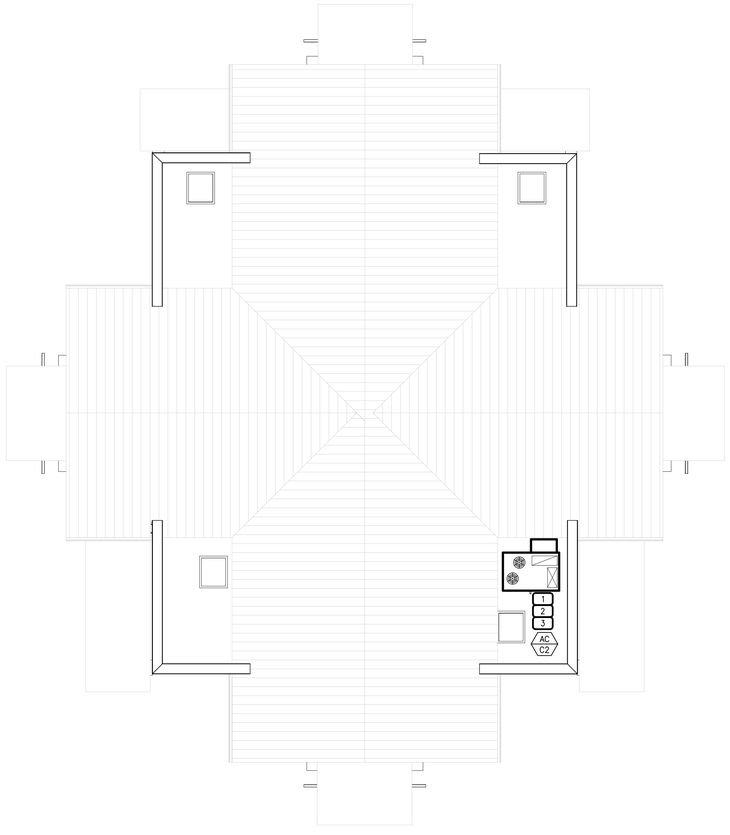

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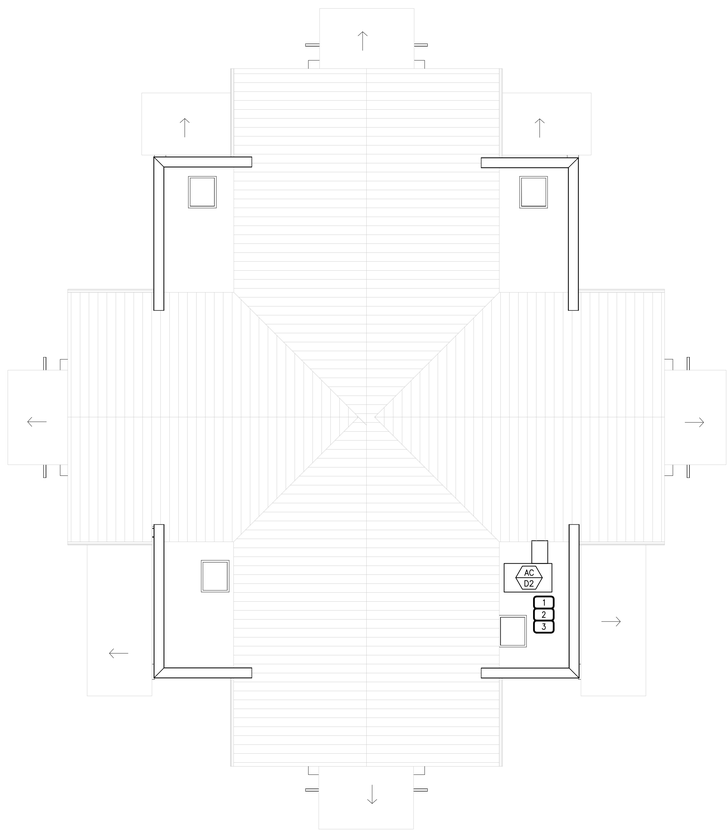

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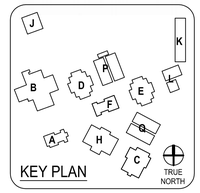

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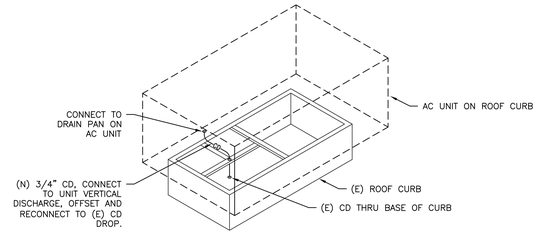
HVAC
ROOF PLANS
BLDG C

SK-M5



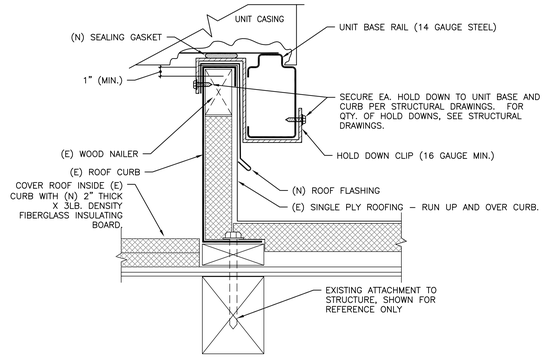
NOTES:

1. EXISTING CONDENSATE DRAINS ARE VERTICAL DISCHARGE AND DRAIN THRU CURB.
2. CONTRACTOR TO CLEAR/CLEAN EXISTING CONDENSATE DRAINS (WITH COMPRESSED AIR) AFTER UNIT IS REMOVED/PRIOR TO INSTALLING NEW UNIT.
3. CONTRACTOR TO CONNECT NEW UNIT CD TO EXISTING.
4. NEW CONDENSATE DRAIN TO BE 3/4" TYPE L COPPER WITH SOLDERED JOINTS

CONDENSATE TRAP DETAIL

NTS

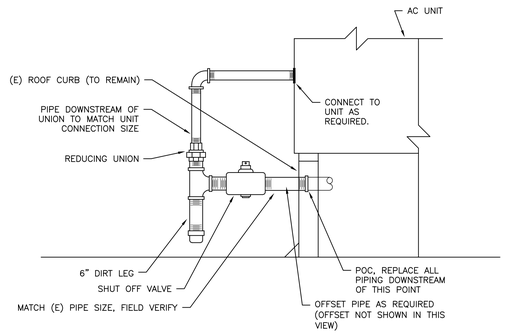
3 / M5.01

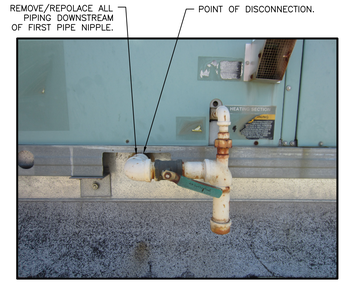


AC UNIT ON EXISTING CURB MOUNTING DETAIL

NTS

2 / M5.01





TYPICAL IMAGE OF EXISTING CONNECTION

NOTES:

1. CLEAN/PAINT ALL NEW AND EXISTING GAS PIPING.
2. PROVIDE NEW SHUT OFF VALVE.
3. ALL PIPING DOWNSTREAM OF SHUT-OFF VALVE TO BE NEW
4. MODIFY (CUT) NEW ROOF CURB AS MAY BE NECESSARY TO FIT AROUND (E) GAS PIPE.

GAS CONNECTION TO EXISTING AC UNIT DETAIL

NTS

1 / M5.01

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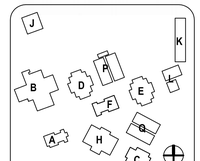

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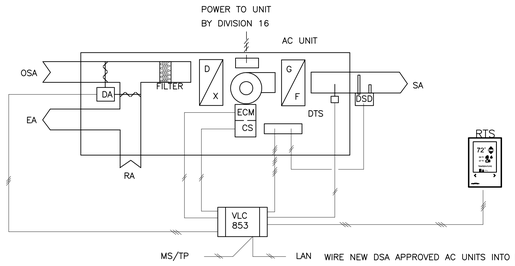
HVAC DETAILS

SK-M6

ALERTON SYSTEM ARCHITECTURE

1. PROVIDE ALERTON COMPASS SYSTEM



WIRE NEW DSA APPROVED AC UNITS INTO EXISTING CAMPUS ALERTON CONTROL SYSTEM

AC-A2, G3, C2, F2 UNIT CONTROL DIAGRAM

1. SEE PLANS AND SCHEDULES FOR QUANITIES. TYPICAL OF 27 UNITS
2. ECONOMIZER DAMPERS AND BELIMO ACTUATORS PROVIDED BY FACTORY.
3. MOUNT VLC CONTROLLER IN AC UNIT OR IN NEMA 3R SC ENCLOSURE.
4. SEE PLANS AND SCHEDULES FOR UNITS THAT REQUIRE DUCT SMOKE DETECTORS

MATERIAL LEGEND

ALL PART NUMBERS ARE ALERTON BACTALK UNLESS OTHERWISE NOTED

SYMBOL	DESCRIPTION
ACM	ALERTON GLOBAL CONTROL MODULE
VLC	VISUAL LOGIC NATIVE BACNET CONTROLLER (SIZE AS REQUIRED)
RTS	MICROSET4 ROOM TEMPERATURE AND HUMIDIY SENSOR WITH BACKLIT DIGITAL DISPLAY DISPLAYING SETPOINT, ROOM TEMP., AND OUTSIDE AIR TEMP. COMPLETE WITH ADJUSTABLE SETPOINT AND OVERRIDE FUNCTIONS.
SS	BLANK STAINLESS STEEL ROOM SENSOR
DTS	6" DUCT TEMPERATURE SENSOR
CS	VERIS H–600 CURRENT SWITCH
DA	FACTORY PROVIDED BELIMO DAMPER ACTUATOR (SIZE AS REQD)
MS	MOTOR STARTER WITH 120V CONTROL CIRCUIT BY OTHERS
ENCL–1	NEMA–1 CONTROL PANEL FOR INDOOR MOUNTING
ENCL–3R	NEMA–3R CONTROL PANEL FOR OUTDOOR MOUNTING
CO2	VERIS 0–2000 PPM ROOM CO2 SENSOR
DPX	VERIS DIFFERENTIAL PRESSURE TRANSDUCER
VFD	FACTORY PROVIDED POWER EXHAUST VFD INTERLOCK TO OSA DAMPER
RIB	FUNCTIONAL DEVICES RELAY IN A BOX
SD	FIRE MARSHALL APPROVED DUCT SMOKE DETECTOR (PROVIDED BY DIV 16)
PWR	POWER TO EQUIPMENT BY DIVISION 16
PWR/FA	120V PWR AND FIRE ALARM WIRING BY DIV. 16
TX	120V TO 24V TRANSFORMER
MS/TP	BACNET NETWORK FOR COMMUNICATIONS
DSD	CSFM APPROVED DUCT SMOKE DETECTOR – WIRE TO STOP SUPPLY FAN ON DETECTION OF PRODUCTS OF COMBUSTION

EA	EXHAUST AIR	AI	ANALOG INPUT
SA	SUPPLY AIR	BI	BINARY INPUT
RA	RETURN AIR	AO	ANALOG OUTPUT
OSA	OUTSIDE AIR	BO	BINARY OUTPUT

WIRING BY TEMPERATURE CONTROL CONTRACTOR (TCC)

WIRING BY DIVISION 16 ELECTRICAL CONTRACTOR (EC)

THESE CONTROL DIAGRAMS ARE DIAGRAMMATIC AND DO NOT DEPICT ALL CONTROL WIRES, RELAYS OR COMPONENTS OF A COMPLETE SYSTEM. IT IS THE RESPONSIBILITY OF THE TEMPERATURE CONTROLS CONTRACTOR TO PROVIDE A COMPLETE AND FUNCTIONAL CONTROL SYSTEM AT NO ADDITIONAL COST TO THE OWNER.

SEQUENCE OF OPERATIONS

SYSTEM GENERAL
PROVIDE AN ALERTON BACTALK SYSTEM AS SHOWN ON THE DRAWINGS. ALL SYSTEM TEMPERATURES AND STATUS SHALL BE DISPLAYED AND BE ADJUSTABLE FROM THE ELK GROVE UNIFIED SCHOOL DISTRICT ALERTON ENVISION FOR BACTALK WORKSTATION AND THE ALERTON WEBTALK IPORT.

TEMPERATURE CONTROL CONTRACTOR (TCC) SHALL WORK WITH THE ENGINEER AND OWNER TO ADJUST THE BUILDING CONTROL SETTINGS AS NEEDED. TCC SHALL INSTALL ALL MS/TP VLC CONTROLLER WIRING IN EMT CONDUIT BETWEEN BCM AND ALL VLC CONTROLLERS. TCC TO PROVIDE BACKLIT LCD STYLE MICROSET 4 ROOM TEMPERATURE SENSOR/CONTROLLER FOR EACH AC UNIT.

AC UNIT OPERATION:
DURING PERIODS OF OCCUPANCY THE AC UNIT VLC CONTROLLER WILL ENABLE THE FAN, ECONOMIZER AND STAGES OF HEATING AND COOLING TO MAINTAIN ROOM SETPOINT. TCC SHALL PROVIDE ALL ECONOMIZER CONTROLS FROM VLC CONTROLLER. ECONOMIZER ALGORITHMS SHALL BE BASED UPON GLOBAL OUTSIDE AIR DRY BULB TEMPERATURE SENSOR AND UNIT SUPPLY AIR SENSOR. MINIMUM OUTSIDE AIR DAMPER POSITION SHALL BE DISPLAYED AND ADJUSTABLE FROM EACH DETAILED INDIVIDUAL UNIT CONTROL PANEL GRAPHIC.
ON A CALL FOR COOLING THE VLC CONTROLLER WILL MODULATE THE ECONOMIZER DAMPERS TO OPERATE AS THE FIRST STAGE OF COOLING AS LONG AS THE OUTSIDE AIR TEMPERATURE IS BELOW THE OUTSIDE AIR LOCKOUT TEMPERATURE SET AT 65 DEGREES (ADJUSTABLE). IF DURING ECONOMIZER OPERATION, THE VLC CANNOT MAINTAIN ROOM COOLING SETPOINT THEN THE VLC WILL ENABLE STAGES OF DX COOLING IN CONJUNCTION WITH THE ECONOMIZER TO MAINTAIN ROOM COOLING SETPOINT. IF THE TEMPERATURE RISES ABOVE THE OUTSIDE AIR LOCKOUT TEMPERATURE THE VLC WILL CLOSE THE ECONOMIZER DAMPER TO MINIMUM POSITION AND ENABLE STAGES OF DX COOLING TO MAINTAIN ROOM COOLING SET POINT. ON A CALL FOR HEATING THE VLC WILL POSITION THE ECONOMIZER DAMPERS TO MINIMUM POSITION AND ENABLE STAGES OF HEATING TO MAINTAIN ROOM HEATING SETPOINT. A SUPPLY AIR SENSOR IS REQUIRED TO PERFORM THE UNITS ECONOMIZER FUNCTIONS AS WELL AS PROVIDE INFORMATION FOR TROUBLESHOOTING PURPOSES. THE OUTSIDE AIR DAMPER WILL BE MODULATED CLOSED UPON UNIT SHUTDOWN. TCC SHALL INSTALL THE FACTORY PROVIDED PRESSURE TUBE INTO THE ROOM SERVED BY THE AC UNIT. THE POWER EXHAUST FAN WILL BE ENABLED INTERNALLY BY THE UNIT WHENEVER THE OUTSIDE AIR DAMPER IS OPEN GREATER THAN 70 PERCENT (SET AT THE UNIT FACTORY). THE FACTORY DIFFERENTIAL PRESSURE TRANSDUCER WILL THEN MODULATE THE POWER EXHAUST FAN VFD TO MAINTAIN A POSITIVE .02 INCHES W.C. (SET AT THE UNIT FACTORY).

CO2 CONTROL:
ALL INDICATED AC UNITS (SEE EQUIPMENT SCHEDULES) SHALL MONITOR THE CARBON DIOXIDE LEVEL IN THE CONTROLLED SPACE (ANALOG INPUT) AND OVERRIDE THE CONTROL OF THE ECONOMIZER DAMPERS TO ADMIT INCREASING AMOUNTS OF OUTSIDE AIR AS NECESSARY TO MAINTAIN THE CARBON DIOXIDE LEVEL BELOW THE CO2 PPM SETPOINT. (ADJUSTABLE). THE CONTROLLED PRESET LIMIT SHALL BE DETERMINED AT THE TIME OF THE SYSTEM START–UP AND SHALL BE ADJUSTABLE FROM A GRAPHIC SCREEN GENERATED BY THE CONTROL CONTRACTOR. SEE AC UNIT SCHEDULES FOR MINIMUM AIR QUANTITIES DURING NORMAL AC UNIT OPERATION (MIN. DAMPER POSITION) AND CO2 PURGE OPERATION (MAXIMUM DAMPER POSITION).

SPLIT SYSTEM SAC UNITS:
TCC TO INTERLOCK THE LOW VOLTAGE CONTROL CIRCUIT BETWEEN THE ACI UNIT AND THE ACO UNIT. TCC TO ALSO INSTALL THE FACTORY PROVIDED ACI ROOM THERMOSTAT AND MOUNT A BLANK STAINLESS STEEL EMS ROOM SENSOR ADJACENT TO THE THERMOSTAT FOR EMS MONITORING.

EXHAUST FAN CONTROL:
EXHAUST FANS SHALL BE INTERLOCKED TO RUN WHEN EITHER THE UNIT(S) SERVING THE EF'S RESPECTIVE AREA IS IN OPERATION BY THE TCC OR THE EXHAUST FAN SHALL BE INTERLOCK TO OPERATE WITH THE LIGHTS BY DIVISION 16. SEE EXHAUST FAN INTERLOCK SCHEDULE.

POWER WIRING:
POWER WIRING TO ALL EQUIPMENT AND 120V POWER WIRING TO CONTROL PANELS SHALL BE BY ELECTRICAL CONTRACTOR. COORDINATE WITH CONTROLS CONTRACTOR.

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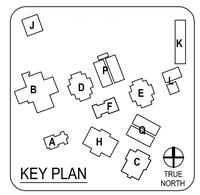

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HVAC DETAILS

SK-M7

SYMBOLS LIST

SOME OF THESE SYMBOLS SHOWN MAY NOT BE USED ON THIS PROJECT

POWER DISTRIBUTION

- SWITCHBOARD, DISTRIBUTION BOARD, SUBSTATION OR MOTOR CONTROL CENTER, FLOOR MOUNTED.
- PANELBOARD, 277/480V, SURFACE MOUNTED ON WALL.
- PANELBOARD, 277/480V, FLUSH MOUNTED IN WALL.
- PANELBOARD, 120/208V, SURFACE MOUNTED ON WALL.
- PANELBOARD, 120/208V, FLUSH MOUNTED IN WALL.
- DRY-TYPE STEP-DOWN TRANSFORMER, FLOOR MOUNTED 3Ø,480-120/208V, UON.
- ELECTRIC MOTOR, NIEC. MAKE POWER CONNECTIONS ONLY AS NOTED ON PLANS.
- (F) INDOOR EXHAUST FAN MOTOR, SINGLE PHASE. MAKE POWER CONNECTIONS TO INCLUDE JUNCTION BOX MOUNTED MANUAL MOTOR STARTER AND DISCONNECT ADJACENT TO FAN WITH 2 #12 CONDUCTORS PLUS GROUND IN 1/2" FLEXIBLE CONDUIT BETWEEN STARTER AND MOTOR.
- (V) INDOOR FAN POWERED VAV BOX MOTOR, SINGLE PHASE, MOUNTED FROM STRUCTURE ABOVE, NIEC. MAKE POWER CONNECTIONS TO INCLUDE JUNCTION BOX MOUNTED MANUAL MOTOR STARTER AND DISCONNECT ADJACENT TO VAV BOX WITH 2 #12 CONDUCTORS PLUS GROUND IN 1/2" FLEXIBLE CONDUIT BETWEEN STARTER AND MOTOR.
- P PULLBOX OR HANDHOLE, SIZE AND TYPE AS NOTED ON PLANS.
- AH, AH SAFETY DISCONNECT SWITCH, 3 POLE, UON. ADJACENT NUMBER INDICATES FUSE SIZE WHEN APPLICABLE. LABELING CONVENTION AS FOLLOWS:

A: 30A, NON-FUSED	AF: 30A, FUSED
B: 60A, NON-FUSED	BF: 60A, FUSED
C: 100A, NON-FUSED	CF: 100A, FUSED
D: 200A, NON-FUSED	DF: 200A, FUSED
E: 400A, NON-FUSED	EF: 400A, FUSED
F: 600A, NON-FUSED	FF: 600A, FUSED
G: 800A, NON-FUSED	GF: 800A, FUSED

- 1 MAGNETIC MOTOR STARTER. ADJACENT NUMBER INDICATES NEMA SIZE OF STARTER.
- 1 COMBINATION MAGNETIC MOTOR STARTER/SAFETY DISCONNECT SWITCH. ADJACENT NUMBER INDICATES NEMA SIZE OF STARTER.
- PACKAGE MOTOR CONTROLLER OR STARTER FURNISHED AND INSTALLED UNDER ANOTHER DIVISION WITH EQUIPMENT CONTROLLED. PROVIDE SINGLE-POINT POWER SERVICE CONNECTION UNDER THIS DIVISION AS NOTED ON PLANS.
- VFD VARIABLE FREQUENCY DRIVE FURNISHED AND INSTALLED UNDER ANOTHER DIVISION. PROVIDE POWER SERVICE CONNECTION UNDER THIS DIVISION AS NOTED ON PLANS.
- VFD VARIABLE FREQUENCY DRIVE WITH INTEGRAL DISCONNECT FURNISHED AND INSTALLED UNDER ANOTHER DIVISION. PROVIDE POWER SERVICE CONNECTION UNDER THIS DIVISION AS NOTED ON PLANS.
- DRIVEN GROUND ROD.
- DRIVEN GROUND ROD IN GROUND WELL WITH COVER.
- ELECTRICAL VEHICLE CHARGING STATION, WALL MOUNTED.
- ELECTRICAL VEHICLE CHARGING STATION, PEDESTAL MOUNTED.
- 2,4,6 BRANCH CIRCUIT POWER DISTRIBUTION BOX OF MANUFACTURED WIRING SYSTEM WITH MODULAR CONNECTORS FOR INTERFACE TO BRANCH CIRCUIT MODULAR CABLE SETS AND CABLE OR CONDUIT HOMERUN. BOX MOUNTED FROM STRUCTURE ABOVE IN ACCESSIBLE CEILING SPACE. ADJACENT NUMBERS INDICATE CIRCUITS AVAILABLE AT BOX.
- 2,4,6 DEVICE BRANCH CIRCUIT POWER DISTRIBUTION BOX FOR INTERFACE BETWEEN MULTI-CIRCUIT HOMERUN AND MC CABLE BRANCH CIRCUITING. MINIMUM BOX SIZE IS 10"X10"X4" DEEP. BOX MOUNTED FROM STRUCTURE ABOVE IN ACCESSIBLE CEILING SPACE. ADJACENT NUMBERS INDICATE CIRCUITS AVAILABLE AT BOX.
- INDICATES CABLE TERMINATION LUGS AT EQUIPMENT BUS.
- BOLTED PRESSURE OR HIGH PRESSURE CONTACT SWITCH.
- FUSED SWITCH.
- MEDIUM-VOLTAGE LOAD INTERRUPTER SWITCH.
- GROUP MOUNTED MOLDED CASE CIRCUIT BREAKER.
- INDIVIDUALLY FIXED MOUNTED INSULATED-CASE OR POWER CIRCUIT BREAKER.
- INDIVIDUALLY DRAW-OUT MOUNTED INSULATED-CASE OR POWER CIRCUIT BREAKER.
- VM MEDIUM-VOLTAGE, INDIVIDUALLY DRAW-OUT MOUNTED VACUUM CIRCUIT BREAKER.
- G INDICATES INTEGRAL GROUND FAULT RELAY WHEN ASSOCIATED WITH CIRCUIT BREAKER.
- C INDICATES COMMUNICATION NETWORK WIRING WHEN ASSOCIATED WITH CIRCUIT BREAKER.
- ER INDICATES ELECTRICALLY OPERATED WHEN ASSOCIATED WITH CIRCUIT BREAKER.
- ST INDICATES SHUNT TRIP WHEN ASSOCIATED WITH OVERCURRENT PROTECTION DEVICES.
- K 1 INDICATES KIRK-KEY INTERLOCK WHEN ASSOCIATES WITH OVERCURRENT PROTECTION DEVICES. ADJACENT NUMBER CORRESPONDS WITH DEVICE INTERLOCK.
- GFR GROUND FAULT RELAY WITH SHUNT TRIP.
- GFA GROUND FAULT ALARM, NO SHUNT TRIP.
- M UTILITY METER.
- TRANSFORMER.
- CONNECTION TO GROUND.
- CURRENT TRANSFORMERS.
- POTENTIAL TRANSFORMERS.
- V AUTOMATIC OR MANUAL TRANSFER SWITCH.
- NORM. EM. AUTOMATIC TRANSFER/BY-PASS ISOLATION SWITCH.
- G EMERGENCY GENERATOR.
- BATTERIES.
- NEUTRAL SERVICE DISCONNECT LINK.
- SPD SURGE PROTECTION DEVICE, 'SPD'.
- C CONTROL CONTACTOR.
- NORMALLY OPEN CONTACT.
- NORMALLY CLOSED CONTACT.
- DMU DIGITAL METERING UNIT.
- WHM WATT HOUR METER.
- GND GROUND BUS.
- NEU NEUTRAL BUS.

CONVENTIONS

- 1 NUMBERED NOTE, APPLIES TO ALL DRAWINGS.
- 1 NUMBERED SHEET NOTE, APPLIES TO DRAWING CONTAINING NOTES ONLY.
- 1 OVERCURRENT PROTECTIVE DEVICE SPACE IDENTIFICATION TAG. REFERS TO LOCATION OF PROTECTIVE OR CONTROL DEVICE WITHIN SWITCHBOARDS, DISTRIBUTION BOARDS, MOTOR CONTROL CENTERS, ETC.
- NAME EQUIPMENT IDENTIFICATION TAG: ITEM FURNISHED AND INSTALLED UNDER ANOTHER SECTION AND WIRED UNDER THIS SECTION.
- P2 CABLE AND/OR RACEWAY TAG, FUNCTION AS NOTED BELOW:

  P = POWER T = TELEPHONE C = COMMUNICATION
- 2004 FEEDER SIZE. REFER TO FEEDER SCHEDULE.
- A / EXX.XX DETAIL REFERENCE:
  - SHEET NUMBER
  - DETAIL DESIGNATION
- 2-F3 FIXTURE IDENTIFICATION TAG:
  - FIXTURE TYPE
  - QUANTITY
- EXISTING BUILDING OR PORTION OF A BUILDING

WIRING DEVICES

- J JUNCTION BOX, WALL MOUNTED, +18" UON.
- K JUNCTION BOX, MOUNTED IN FLUSH FLOOR BOX.
- J JUNCTION BOX, MOUNTED FLUSH IN CEILING.
- J JUNCTION BOX, SURFACE OR PENDANT MOUNTED TO STRUCTURE IN ACCESSIBLE CEILING SPACE.
- JC JUNCTION BOX, MOUNTED ON CONDUIT STANCHION FLOOR PENETRATION, +12" UON.
- SINGLE-PLEX CONVENIENCE RECEPTACLE DEVICE, WALL MOUNTED, +18" AFF UON.
- USB 'USB' DENOTES DUPLEX CONVENIENCE RECEPTACLE DWBICE WITH INTERGRAL USB POWER OUTLETS, WALL MOUNTED, +18" AFF UON.
- IG 'IG' DENOTES ISOLATED GROUND. DUPLEX CONVENIENCE RECEPTACLE DEVICE, WALL MOUNTED, +18" AFF UON.
- DOUBLE DUPLEX CONVENIENCE RECEPTACLE DEVICE, WALL MOUNTED, +18" AFF UON.
- DENOTES WALL MOUNTED OVER COUNTER, 6" ABOVE BACK SPLASH UON.
- G 'G' DENOTES GROUND FAULT CURRENT INTERRUPTER (GFCI), 'A' DENOTES ARC FAULT CURRENT INTERRUPTER (AFCI).
- WP DUPLEX RECEPTACLE, WEATHER RESISTANT WITH GROUND FAULT CURRENT INTERRUPTER 'GFCI', WITH WEATHERPROOF COVER, WALL MOUNTED, +18" AFF UON.
- SHADING DENOTES SPLIT WIRED DEVICE.
- SHADING DENOTES DEVICE CONNECTED TO EMERGENCY POWER CIRCUIT.
- SHADING DENOTES CONTROLLED RECEPTACLE.
- SHADING DENOTES SPECIALTY DEVICE, TYPE AS NOTED ON PLANS.
- DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED IN FLUSH FLOOR BOX.
- DOUBLE DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED IN FLUSH FLOOR BOX.
- DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED IN FIRE-RATED POKE-THRU FLOOR FITTING.
- DOUBLE DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED IN FIRE-RATED POKE-THRU FLOOR FITTING.
- DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED FLUSH IN CEILING.
- DOUBLE DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED FLUSH IN CEILING.
- DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED ON CONDUIT STANCHION FLOOR PENETRATION, +12" AFF UON.
- DUPLEX CONVENIENCE RECEPTACLE DEVICE, MOUNTED IN FLOOR MONUMENT.
- COMBINATION POWER/TELECOMMUNICATION DEVICE, MOUNTED IN FLUSH FLOOR BOX. TYPE AS NOTED ON PLANS OR IN SPECIFICATIONS.
- DUPLEX CONVENIENCE RECEPTACLE DEVICE, CORD OR REEL HUNG FROM STRUCTURE ABOVE. TYPE AS NOTED ON PLANS.
- ELECTRIFIED FURNITURE PARTITION POWER FEED, WALL MOUNTED, +18" AFF UON. CONSISTS OF 4 11/16" SQ. X 2 1/8" DEEP. JUNCTION BOX, SINGLE GANG RING, AND STAINLESS STEEL COVER PLATE WITH KO TO ACCEPT FURNITURE WHIP.
- ELECTRIFIED FURNITURE PARTITION COMBINATION POWER/TELECOMMUNICATION FEEDS, MOUNTED IN FLUSH FLOOR BOX WITH KO'S IN COVER TO ACCEPT FURNITURE WHIPS
- ELECTRIFIED FURNITURE PARTITION POWER FEED, MOUNTED IN FIRE-RATED POKE-THRU FLOOR FITTING WITH KO IN COVER TO ACCEPT FURNITURE WHIP.
- POWER/TELECOMMUNICATION POLE, MOUNTED TO EXTEND FROM FLOOR TO CEILING. TYPE AS NOTED ON PLANS.
- S SINGLE-POLE, SINGLE-THROW SWITCH, WALL MOUNTED, +42" AFF UON.
- S^3 THREE-WAY SWITCH, WALL MOUNTED, +42" AFF UON.
- S^4 FOUR-WAY SWITCH, WALL MOUNTED, +42" AFF UON.
- S^K KEY-OPERATED, SINGLE-POLE, SINGLE-THROW SWITCH, WALL MOUNTED, +42" AFF UON.
- S^P PILOT LIGHT, SINGLE-POLE, SINGLE-THROW SWITCH, WALL MOUNTED, +42" AFF UON.
- S^T MANUAL MOTOR STARTER SWITCH WITH THERMAL OVERLOAD ELEMENT, MOUNTED ADJACENT TO MOTOR.
- S^M MANUAL MOTOR STARTER/DISCONNECT SWITCH, MOUNTED ADJACENT TO MOTOR.
- S^F SWITCH FURNISHED UNDER ANOTHER DIVISION, BUT INSTALLED AND WIRED UNDER THIS DIVISION, WALL MOUNTED, +42" AFF UON.
- S^D WALL BOX DIMMER SWITCH, +42" AFF UON. SIZED PER CONNECTED LOAD ON PLANS AND FURNISHED FOR LAMP SOURCE SERVED. PROVIDED FOR DE-RATING WHEN INSTALLED GANGED LOCATIONS.
- S^{TC} SINGLE-POLE, TIMER CONTROLLED SWITCH, WALL MOUNTED, +42" AFF UON.
- S^{EP} SINGLE-POLE, SINGLE-THROW, EXPLOSION PROOF SWITCH, WALL MOUNTED, +42" AFF UON.
- SH LINE-VOLTAGE MULTIPLE GANG SWITCHING STATION, WALL MOUNTED, 42" AFF UON. REFER TO PLANS FOR DEVICE QUANTITIES AND TYPES.
- L LOW-VOLTAGE LIGHTING CONTROL SWITCHING STATION, WALL MOUNTED, +42" AFF UON. REFER TO PLANS AND SCHEDULES FOR DEVICE QUANTITIES AND RELAYS CONTROLLED
- MS LIGHTING CONTROL OCCUPANCY SENSOR WITH DUAL LEVEL SWITCHING, WALL MOUNTED, +42" AFF UON.
- MS LIGHTING CONTROL OCCUPANCY SENSOR WITH SINGLE LEVEL SWITCHING, WALL MOUNTED, +42" AFF UON.
- M LIGHTING CONTROL OCCUPANCY SENSOR, CEILING MOUNTED FOR AREA COVERAGE.
- D PRESET SCENE CONTROL LIGHTING STATION WITH DIMMING CAPABILITIES, WALL MOUNTED, +42" AFF UON. REFER TO PLANS AND SCHEDULES FOR CONTROL.
- DS COMBINATION LIGHTING CONTROL DIMMER/MOTION SENSOR, WALL MOUNTED, +42", AFF UON.
- ETD EGRESS LIGHTING TRANSFER DEVICE
- CONTROL STATION, WALL MOUNTED, +42" AFF UON.
- PC PHOTOELECTRIC CELL
- DS DAYLIGHT SENSOR

RACEWAYS

- CONDUIT RUN EXPOSED ON WALL OR CEILING.
- CONDUIT RUN CONCEALED IN SLAB, UNDER SLAB OR UNDERGROUND.
- CONDUIT RUN CONCEALED IN WALL OR ABOVE CEILING.
- CONDUIT HOMERUN, CONTINUOUS RUN TO PANEL OR EQUIPMENT CABINET.
- FLEXIBLE METALLIC CONDUIT.
- CONDUIT TURNED UP
- CONDUIT TURNED DOWN.
- CONDUIT CAPPED OR STUBBED WITH INSULATED BUSHINGS.
- CONDUIT SLEEVE, WITH INSULATING BUSHINGS.
- CROSSMARKS ON BRANCH CIRCUIT CONDUIT RUNS INDICATE THE QUANTITY OF CONDUCTORS AS FOLLOWS (GROUND CONDUCTORS ARE NOT NOTED, BUT SHOULD BE INCLUDED IN EVERY CONDUIT WITH POWER CONDUCTORS):
  1. NO CROSSMARKS INDICATES TWO #12 AWG CONDUCTORS, UON.
  2. THREE TO SIX CROSSMARKS INDICATES THE QUANTITY OF #12 AWG CONDUCTORS, UON.
  3. SEVEN OR MORE CROSSMARKS INDICATES THE QUANTITY OF #10 AWG CONDUCTORS, UON.
- MULTI-OUTLET TWO PIECE SURFACE RACEWAY; TYPE, DEVICE SPACING AND MOUNTING AS NOTED ON PLANS.
- TWO PIECE SURFACE METAL RACEWAY, MOUNTED AS NOTED IN PLANS.
- CABLE TRAY, CABLE RUNWAY OR LADDER RACK SUSPENDED FROM STRUCTURE ABOVE. REFER TO PLANS FOR SIZE AND MOUNTING.

PROJECT NOTES

1. UNLESS OTHERWISE NOTED, ALL CIRCUITRY SHOWN ON THESE DOCUMENTS IS DONE PER THE "ROUNDHOUSE" METHOD. FOR EVERY GROUP OF THREE (3) CONSECUTIVE CIRCUITS IN PHASE ORDER, THERE IS A DEDICATED NEUTRAL. FOR EXAMPLE, A HOMERUN COMPRISED OF CIRCUITS 1, 3 AND 5 CONTAINS FOUR (4) CONDUCTORS; THREE (3) HOTS AND ONE (1) NEUTRAL. A HOMERUN COMPRISED OF NON- CONSECUTIVE NUMBERS OUT OF PHASE ORDER .I.E. 1, 9 AND 11 OR 3, 5, 7 CONTAINS FIVE (5) CONDUCTORS; THREE (3) HOTS AND TWO (2) NEUTRALS. GROUND CONDUCTORS TYPICALLY ARE NOT SHOWN AS PART OF THE WIRE COUNT.
2. INSTALL AND CONNECT A CODE SIZED INSULATED OR BARE COPPER GROUNDING CONDUCTOR IN ALL BRANCH CIRCUITS AND FEEDERS.
3. MOUNTING HEIGHTS SHOWN ARE FROM FINISHED FLOOR TO THE CENTERLINE OF THE DEVICE. ALL MOUNTING HEIGHTS SHALL BE AS SHOWN ON THE SYMBOLS LIST UNLESS OTHERWISE NOTED ON THE PLANS OR IN THE SPECIFICATIONS.
4. REFER TO POWER PLANS FOR THE LOCATION OF ALL PANELBOARDS.
5. FURNISH AND INSTALL ALL PANELBOARDS WITH CIRCUIT BREAKERS AS SHOWN ON PANEL SCHEDULES.
6. REFER TO ELECTRICAL PLANS FOR THE FIXTURE SCHEDULE.
7. SUBSCRIPTS ON SWITCH SYMBOLS (Sa) DENOTE THE FIXTURE CONTROLLED.
8. DO NOT INSTALL POWER OUTLETS BACK TO BACK IN STUD WALLS.
9. REFER TO ELECTRICAL ONE LINE DIAGRAM AND FEEDER SCHEDULE FOR THE SIZE OF CONDUITS AND CONDUCTORS BETWEEN MAJOR POWER COMPONENTS OF THE ELECTRICAL SYSTEM.
10. REFER TO ARCHITECTURAL PLANS FOR DIMENSIONAL LOCATION OF OUTLETS AND FIXTURES AND LOCATION IN ELEVATION VIEW.
11. ALL ELECTRICAL MATERIALS AND EQUIPMENT SHALL BE LISTED BY UNDER-WRITERS LABORATORIES AND BEAR THEIR LABEL.
12. CONTRACTOR SHALL REMOVE ALL LEFT OVER CONDUIT, WIRE, SCRAPS, ETC. AND LEAVE PREMISES CLEAN AND FREE OF TRASH OR DEBRIS RESULTING FROM HIS WORK.
13. PROVIDE INDIVIDUAL GFCI RECEPTACLES AT EACH LOCATION SHOWN, DO NOT USE FEED-THRU GFCI TYPE RECEPTACLES. LOCATE RECEPTACLE AT END OF A BRANCH CIRCUIT WIRE.
14. VERIFY THE EXACT LOCATION OF ALL MECHANICAL AND PLUMBING EQUIPMENT, SPRINKLER VALVE MONITORS AND FLOW SWITCHES. DUCT SMOKE DETECTORS, CONTROL DEVICES, ETC. PRIOR TO DETERMINING CONDUIT TERMINATION POINTS.
15. CONDUIT ROUTING (WHERE SHOWN) IS ESSENTIALLY DIAGRAMMATIC. CONTRACTOR SHALL LAYOUT RUNS TO SUIT FILED CONDITIONS AND THE COORDINATION REQUIREMENTS OF OTHER TRADES.
16. ALL CONDUIT AND RACEWAY PENETRATIONS THROUGH FIRE RATED WALLS AND FLOORS SHALL BE SEALED TO MAINTAIN THE FIRE SEPARATION RATING. REFER TO ARCHITECTURAL PLANS TO IDENTIFY ALL RATED CONSTRUCTION.
17. INSTALL A POLYETHYLENE PULLING ROPE IN ALL EMPTY CONDUITS.
18. FIXTURES INDICATED AS EMERGENCY, WITH BATTERY BACK-UP, SHALL BE WIRED FOR NORMAL OPERATION (SWITCHED) U.O.N. DO NOT WIRE AS NIGHT LIGHT (24 HOUR OPERATION) U.O.N. EXIT LIGHTS ARE EXCEPTION.
19. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS TO VERIFY LOCATION OF CEILING MOUNTED LIGHT FIXTURES. REPORT ANY DISCREPANCIES PRIOR TO ROUGH-IN.
20. ALL EXPOSED CONDUIT, BOXES, SUPPORTS, ETC. SHALL BE PAINTED TO MATCH SURROUNDING SURFACES.
21. ALL EXPOSED CONDUITS, CABLE TRAY, OPEN CABLING SHALL BE ROUTED AT RIGHT ANGLES TO THE BUILDING STRUCTURE.
22. DEVICE/OUTLET BOXES MOUNTED ON OPPOSITE SIDES OF RATED WALLS IN CORRIDORS, AND IN ANY AIRTIGHT SPACES, SHALL BE SEPARATED BY A MINIMUM OF 24".

DSA ANCHORAGE NOTES

ELECTRICAL COMPONENT ANCHORAGE NOTE

ALL ELECTRICAL COMPONENTS SHALL BE INSTALLED AND ANCHORED PER THE DETAILS ON THE DSA APPROVED CONSTRUCTION DOCUMENTS. WHERE NO DETAIL IN INDICATED, THE FOLLOWING COMPONENTS WILL BE ANCHORED OR BRACED TO MEET THE FORCE AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2016 CBC, SECTIONS 1616A.1.18 THROUGH 1616A.1.26 AND ASCE 7-10 CHAPTERS 13, 26, AND 30.

1. ALL PERMANENT EQUIPMENT AND COMPONENTS.
2. ALL 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 WHICH IS STATIONED IN ONE PLACE FOR MORE THAN 8 HOURS AND HEAVIER THAN 400 POUNDS ARE REQUIRED TO BE ANCHORED WITH TEMPORARY ATTACHMENTS.

THE ATTACHMENT OF THE FOLLOWING ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE. BUT 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 HAVE 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 HUNG FROM A WELL.

FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAILS ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD AND THE DSA DISTRICT STRUCTURAL ENGINEER. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH THE ABOVE REQUIREMENTS.

PIPING, DUCTWORK AND ELECTRICAL DISTRIBUTION BRACING NOTE

PIPING, DUCTWORK AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-10 SECTION 13.3 AS DEFINED IN ASCE 7-10 SECTION 13.6.8, 13.6.7, 13.6.5.6 AND 2016 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 PREAPPROVED INSTALLATION GUIDE (e.g. SMACNA OR OSHPD OPM), COPIES OF THE BRACKING SYSTEM INSTALLATION GUIDE OR MANUAL SHALL BE AVAILABLE ON THE JOBSITE PRIOR TO THE START OF AND DURING THE HANGING AND BRACING OF THE DISTRIUBTION SYSTEMS. THE STRUCTURAL ENGINEERING OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGER AND BRACE LOADS.

ELECTRICAL DISTRIBUTION SYSTEMS, OPTION 2: SHALL COMPLY WITH THE APPLICABLE OSHPD PRE-APPROVAL (OPM #) 0052-013.

ABBREVIATIONS

A	AMPERES
AFC	ABOVE FINISHED CEILING
AFI	ARC FAULT CIRCUIT INTERRUPTER
AF	AMPERE OVERCURRENT FRAME SIZE (WHEN APPLIED TO CIRCUIT BREAKERS) OR AMPERE FUSE SIZE (WHEN APPLIED TO FUSES)
AFF	ABOVE FINISHED FLOOR
AIC	ASYMMETRIC INTERRUPTING CURRENT
AL	ALUMINUM
AT	AMPERE OVERCURRENT TRIP (WHEN APPLIED TO CIRCUIT BREAKERS)
ATS	AUTOMATIC TRANSFER SWITCH
BAS	BUILDING AUTOMATION SYSTEM
BFC	BELOW FINISHED CEILING
BOC	BACK OF CURB
BPS	BOLTED PRESSURE CONTACT SWITCH
C	CONDUIT
CCTV	CLOSED CIRCUIT TELEVISION
CL	CURRENT LIMITING CIRCUIT BREAKER OR FUSE
CP	CIRCULATION PUMP
CKT	CIRCUIT
CT	CURRENT TRANSFORMER
CU	COPPER
DF	DRINKING FOUNTAIN
DW	DISH WASHER
(E)	EXISTING TO REMAIN
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EP	EXPLOSION PROOF
EPO	EMERGENCY POWER OFF
EMCS	ENERGY MANAGEMENT CONTROL SYSTEM
EMT	ELECTRICAL METALLIC TUBING
ETD	EMERGENCY TRANSFER DEVICE
EVSE	ELECTRIC VEHICLE SUPPLY EQUIPMENT
EVCS	ELECTRIC VEHICLE CHARGING STATION
EWH	ELECTRIC WATER HEATER
F	FUSED
(F)	FUTURE
FACP	FIRE ALARM CONTROL PANEL
FAJB	FIRE ALARM JUNCTION BOX
FFCP	FIREMAN'S FAN CONTROL PANEL
FLA	FULL LOAD AMPERES
FMC	FLEXIBLE METAL CONDUIT
FSD	FIRE/SMOKE DAMPER
FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR
FRAP	FIREMAN'S REMOTE ANNUNCIATOR PANEL
G	GROUND
GB	GROUND BUS
GD	GARBAGE DISPOSAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
GRAP	GENERATOR REMOTE ANNUNCIATOR PANEL
GWH	GAS WATER HEATER
HPC	HIGH PRESSURE CONTACT SWITCH
HVAC	HEATING,VENTING AND AIR CONDITIONING
IMC	INTERMEDIATE METAL CONDUIT
IWH	INSTANTANEOUS OR POINT OF USE WATER HEATER
JB	JUNCTION BOX
LSCP	LIFE SAFETY CONTROL PANEL
LCP	LIGHTING CONTROL PANEL
MBGB	MAIN BUILDING GROUND BUS
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MLO	MAIN LUGS ONLY
MT	EMPTY
MTC	EMPTY CONDUIT
MTGB	MAIN TELECOM GROUND BUS
MTS	MANUAL TRANSFER SWITCH
MW	MICROWAVE
(N)	NEW
NC	NORMALLY CLOSED
NF	NON-FUSED
NIEC	NOT IN ELECTRICAL CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PDU	POWER DISTRIBUTION UNIT
PIV	POST INDICATING VALVE
PNL	PANEL
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
RF	REFRIGERATOR
(R)	EXISTING TO BE REMOVED
(RL)	RELOCATED
(RR)	REMOVE AND RELOCATE
RSC	RIGID STEEL CONDUIT
SAD	SEE ARCHITECTURAL DRAWINGS
SPD	SURGE PROTECTION DEVICE
TC	TIME CLOCK
TGB	TELECOMMUNICATIONS GROUND BUS
TP	TWISTED-PAIR
TX	TRANSFORMER
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
URAP	UPS REMOTE ANNUNCIATOR PANEL
UR	UNDERCOUNTER REFRIGERATOR
V	VOLTS
VA	VOLTS-AMPS
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
VM	VENDING MACHINE
W	WATTS
WAP	WIRELESS ACCESS POINT
WH	WATER HEATER
WP	WEATHERPROOF
2SP	TWO SPEED
1Ø	1 PHASE
3Ø	3 PHASE
1P	1 POLE
2P	2 POLE
3P	3 POLE
3W	3 WIRE
4W	4 WIRE

DRAWING INDEX

DWG. NO.	TITLE
SK-E1	SYMBOLS LIST & DRAWING INDEX
SK-E2	POWER ROOF PLANS
SK-E3	POWER ROOF PLANS

PBK

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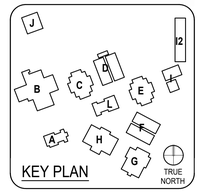
Building a Bright Future for All Learners
Galt Joint Union Elementary School District



PTN:
FILE NO.
IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APPL.
ACS _____ FLS _____ SS _____
DATE _____

ARCHITECT
REGISTERED PROFESSIONAL ENGINEER
SCOTT WHEELER
No. E015491
Exp. 06/30/19
STATE OF CALIFORNIA

CLIENT

PROJECT NUMBER

DATE:
DRAWN BY:
CHECKED BY:
REVISIONS

No.	Description	Date

SYMBOLS LIST & DRAWING INDEX

SK-E1

GENERAL SHEET NOTES

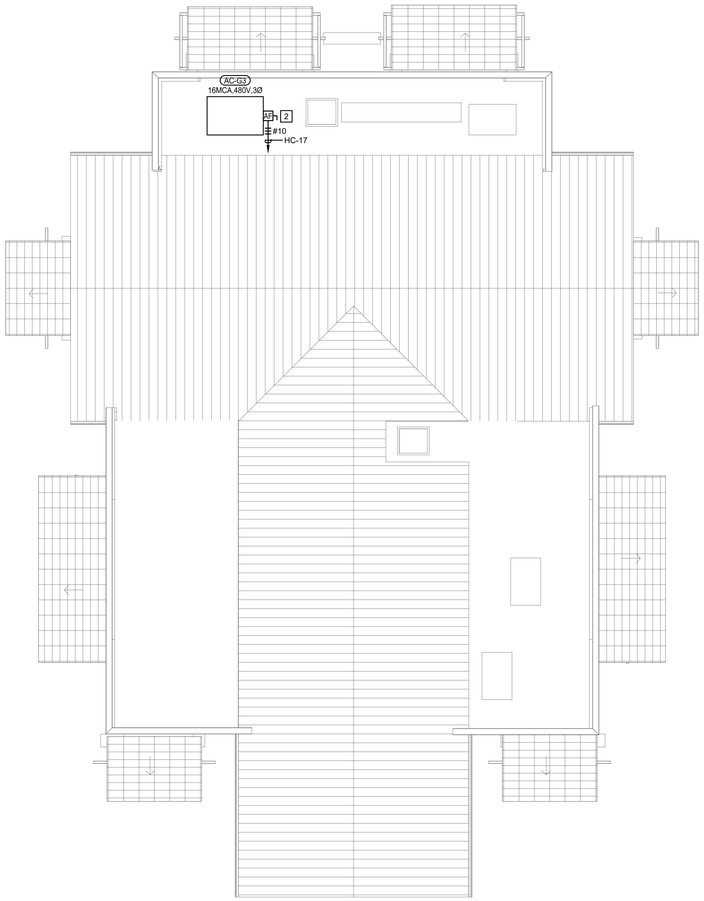
A. SCOPE OF WORK: EXISTING HVAC UNITS TO BE REPLACED WITH NEW, AS INDICATED. PROVIDE NEW SERVICE DISCONNECT. RECONNECT TO EXISTING BRANCH CIRCUIT HOME RUN WIRING; EXISTING WIRE SIZE GIVEN IS PER RECORD DRAWINGS, CONFIRM IN FIELD AND REPORT ANY DISCREPANCIES. WHERE INDICATED, REPLACE EXISTING BREAKER AT EXISTING PANEL, MANUFACTURER AND AIC RATING TO MATCH EXISTING; EXISTING CIRCUIT NUMBER GIVEN IS PER RECORD DRAWINGS, VERIFY IN FIELD.

B. REFER TO MECHANICAL SCHEDULES FOR LISTED OVERCURRENT PROTECTION REQUIREMENTS FOR ALL NEW MECHANICAL EQUIPMENT. COORDINATE WITH APPROVED SUBMITTALS PRIOR TO ORDERING NEW DISCONNECTS, FUSES, OR BREAKERS.

[#] NUMBERED SHEET NOTES

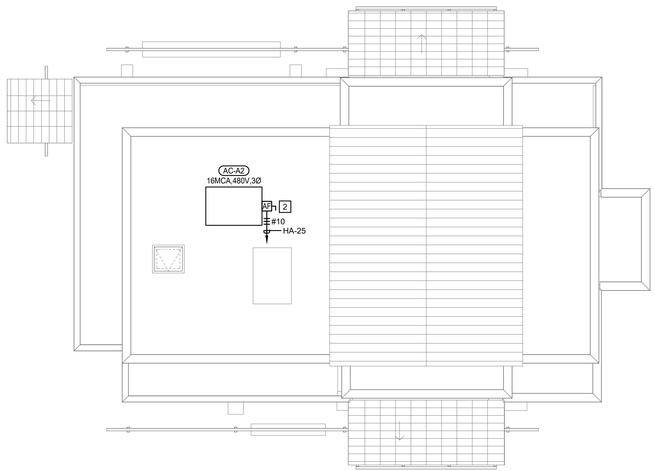
1. NOTE NOT USED.

2. REPLACE EXISTING DISCONNECT WITH NEW, FUSED PER MANUFACTURER'S LISTED MOCP. WHERE REQUIRED, PROVIDE WITH DOUBLE LUGS AND PROVIDE SECOND CONNECTION FROM DISCONNECT TO POWER EXHAUST.



A SK-E2 ROOF PLAN - BLDG G

SCALE:1/8" = 1'-0"



B SK-E2 ROOF PLAN - BLDG A

SCALE:1/8" = 1'-0"

PBK

ARCHITECTURE

PBK ARCHITECTS
2520 VENTURE OAKS DRIVE, SUITE 440
SACRAMENTO, CA 95833
916-682-9494
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MECHANICAL

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WESTONAIE.COM

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AUBURN, CA 95603
530-886-8556
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STRUCTURAL

KPFF CONSULTING ENGINEERS
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ROSEVILLE, CA 95661
916-772-7688
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MARENGO RANCH ELEMENTARY SCHOOL
ADDENDUM #1 - HVAC REPLACEMENT
1000 ELK HILLS DRIVE, GALT, CA 95632

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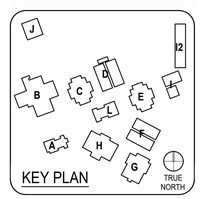

KEY PLAN

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POWER ROOF PLANS

SK-E2

GENERAL SHEET NOTES

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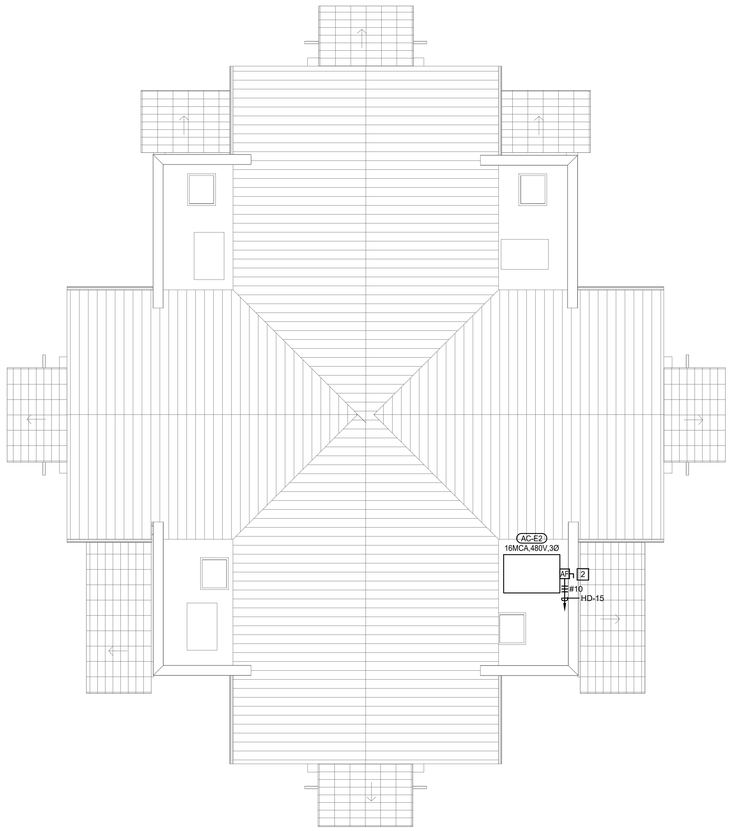
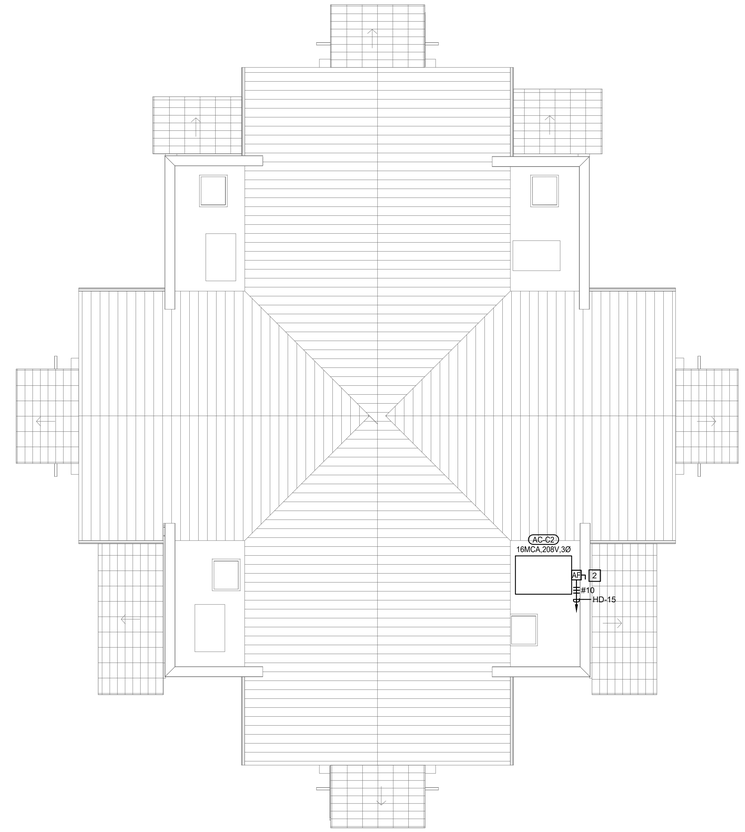


A SK-E3 ROOF PLAN - BLDG E

SCALE:1/8" = 1'-0"



B SK-E3 ROOF PLAN - BLDG C

SCALE:1/8" = 1'-0"

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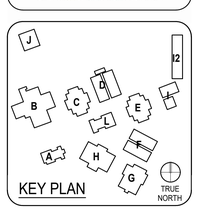

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POWER ROOF PLANS

SK-E3