

CONSULTANT REPORT

GOLD TRAIL UNION SCHOOL DISTRICT

SUTTER'S MILL ELEMENTARY SCHOOL

Prepared for: California Energy Commission

Prepared by: Digital Energy, Inc.



California Energy Commission
Edmund G. Brown Jr., Governor

June 05, 2018
Contract Number: CEC-400-14-001
Work Authorization Number: 159

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Contract Number: 400-14-001
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Prepared for:

California Energy Commission

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DISCLAIMER

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PREFACE

This bid specification document was prepared as a follow up to the energy efficiency report prepared for Gold Trail Union School District under the Bright Schools Program. This California Energy Commission program assists K through 12 schools in identifying measures that can cut energy use and cost in existing and planned facilities, while concurrently enhancing building performance. Once the measures are identified, the program can provide additional assistance to help implement or finance the recommendations. This study was conducted for the Commission by Digital Energy, Inc., under the direction of Jairam Agaram, P.E. The contract assignment was directed and managed with the assistance of Judy Brewster, Project Manager for the Commission. Digital Energy, Inc. and the Commission appreciate the assistance offered by all Gold Trail Union School District personnel during the study.

School Name	Location
Sutter's Mill Elementary School	4801 Luneman Rd, Placerville, CA 95667

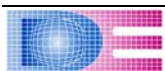


TABLE OF CONTENTS

EXECUTIVE SUMMARY

DIVISION 2 EXISTING CONDITIONS

02 4100 DEMOLITION

DIVISION 23 HEATING VENTILATION AND AIR CONDITIONING

23 0000 GENERAL MECHANICAL REQUIREMENTS

23 0913 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

23 54 16 FUEL-FIRED FURNACES

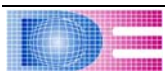
23 81 26 SPLIT AIR CONDITIONING UNIT

23 8143 AIR SOURCE UNITARY HEAT PUMPS

DIVISION 26 ELECTRICAL

26 0160 ELECTRICAL DEMOLITION

APPENDIX A – RETROFIT SCHEDULE



EXECUTIVE SUMMARY

ECM M-1: Installation of Network Thermostats for HVAC Control

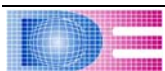
This measure proposes installing network based thermostats for HVAC control.

ECM M-2: Replace old gas electric split units with new energy efficient units

This measure proposes replacing the gas electric split units with new high efficiency units that are over the minimum efficiency standard.

ECM M-3: Replace Old HVAC Units with New High-Efficiency Units

This measure proposes replacing heat pump units with new high-efficiency units



SECTION 02 4100 DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

Drawings and general provisions of the Subcontract apply to this Section.
Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

C. Related Sections:

Division 01 Section, General Requirements.
Division 01 Section, Safety Requirements Article, ACCIDENT PREVENTION PLAN (APP).
Division 01 Section, Temporary Environmental Control.
Division 01 Section, Construction Waste Management.
Division 01 Section, Temporary Facilities and Controls.
Division 02 Section, Traditional Asbestos Abatement.
Division 02 Section, Lead based Paint Removal and Disposal.
Division 31 Section, Grading: Topsoil removal.
Division 31 Section, Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.2 REFERENCES

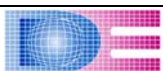
- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards (OSHA); current edition.
B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.3 SUBMITTALS

- A. Comply with Division 01 Section, Submittal Procedures.
B. Demolition Plan: The Contractor shall furnish a demolition plan (drawings) as specified by OSHA and local authorities.

Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
Identify demolition firm and submit qualifications.
Include a summary of safety procedures.

- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

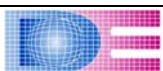


1.4 PROTECTION

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of General Conditions Article, Accident Prevention.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Division 01 Sections, General Requirements, Article Protection of Existing Vegetation, Structures, Equipment, Utilities and Improvements.
- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:

No wall or part of wall shall be permitted to fall outwardly from structures. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Insure all possible users know how to properly use fire extinguishers. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 ft.) of fire hydrants.

- G. Before beginning any demolition work, the Contractor shall survey the site and examine the demolition drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place or to be reused; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.



- H. The work shall comply with the requirements of Division 01 Section, Temporary Facilities and Controls.
- I. The work shall comply with the requirements of Division 01 Section, General Requirements, Article 1.7 Infection Prevention Measures.

PART 2 - PRODUCTS – Not Applicable

PART 3 - EXECUTION

3.1 SCOPE

- A. Remove portions of existing buildings as indicated on drawings.
- B. Remove other items indicated for salvage, relocation, and recycling.
- C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Division 01.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

Obtain required permits.

Comply with applicable requirements of NFPA 24 - Standard for Safeguarding Construction.

Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.

Provide, erect, and maintain temporary barriers and security devices.

Use physical barriers to prevent access to areas that could be hazardous to workers or the public.

Conduct operations to minimize effects on and interference with adjacent structures and occupants.

Do not close or obstruct roadways or sidewalks without permit.

Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

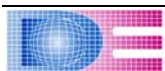
Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Protect existing structures and other elements that are not to be removed.

Provide bracing and shoring.

Prevent movement or settlement of adjacent structures.

Stop work immediately if adjacent structures appear to be in danger.



- E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.

Comply with requirements of Division 01 Section, Waste Management.

Dismantle existing construction and separate materials.

Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.3 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities from being damaged.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing drawings (plans) showing existing construction and utilities are based on casual field observation and existing record documents only.

Verify that construction and utility arrangements are as shown.

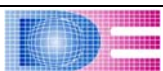
Report discrepancies to Architect before disturbing existing installation.

Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

- B. Separate areas in which demolition is being conducted from other areas that are still occupied.

Provide, erect, and maintain temporary dustproof partitions of construction specified in Division 01 Section, Temporary Facilities and Controls, in locations indicated on demolition drawings.

- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

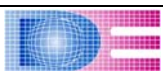


- D. Remove existing work as indicated and as required to accomplish new work.
Remove items indicated on drawings.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications):
Remove existing systems and equipment as indicated.
Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
Where existing active systems serve occupied facilities, but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
Verify that abandoned services serve only abandoned facilities before removal.
Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
Prevent movement of structure; provide shoring and bracing if necessary.
Perform cutting to accomplish removals neatly and as specified for cutting new work.
Repair adjacent construction and finishes damaged during removal work.
Patch as specified for patching new work.
- G. No services or equipment are to be abandoned in place. All decommissioned elements are to be removed.

3.5 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Division 01 Section, Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 4100



SECTION 23 0000 GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Subcontract apply to this Section.
- B. Review these documents for coordination with additional requirements and information that apply to work under this Section.

1.2 SCOPE

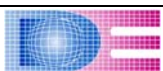
- A. Basic mechanical requirements specifically applicable to Division 23 Sections.
- B. Work includes but is not necessarily limited to the following:

Labor, materials, services, equipment, and appliances required for completion of tasks as indicated on drawing or in specification or as inherently necessary to prepare spaces and systems for new installations as follows:

- a. Heating, ventilating, and air conditioning systems and equipment
- b. Testing, adjusting, and balancing

1.3 DRAWINGS AND SPECIFICATIONS

- A. The Contractor shall furnish mechanical plans/drawings showing the scope of the project.
- B. Drawings accompanying these Specifications show intent of Work to be done. Specifications shall identify quality and grade of installation and where equipment and hardware is not particularly specified, Contractor shall provide submittals for all products and install them per manufacturers' recommendations, and in a first-class manner.
- C. Examine Drawings and Specifications for elements in connection with this Work; determine existing and new general construction conditions and be familiar with all limitations caused by such conditions.
- D. Plans are intended to show general arrangement and extent of Work contemplated. Exact location and arrangement of parts shall be determined after the Owner has reviewed equipment, as Work progresses, to conform in best possible manner with surroundings, and as directed by the Owner.
- E. Contract Documents are in part diagrammatic and intended to show the scope and general arrangement of the Work under this Contract. The Contractor shall follow these drawings in laying out the equipment, piping, and ductwork. Drawings are not intended to be scaled for roughing in measurements or to serve as shop drawings. Where job conditions require minor changes or adjustments in the indicated locations or arrangement of the Work, such changes shall be made without change in the Contract amount.



- F. Follow dimensions without regard to scale. Where no figures or notations are given, the Plans shall be followed.

1.4 UTILITIES

- A. Location and sizes of electrical, mechanical, and plumbing service facilities are shown in accordance with data secured from existing record drawings and site observations. Data shown are offered as an estimating guide without guarantee of accuracy. Check and verify all data given, and verify exact location of all utility services pertaining to Work prior to excavation or performing Work.

1.5 APPLICABLE REFERENCE STANDARDS, CODES, AND REGULATIONS

- A. Meet requirements of all state codes having jurisdiction.
- B. State of California Code of Regulations:

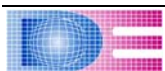
- Title 8, Industrial Relations
- Title 19, State Fire Marshal Regulations
- 2016 California Building Code, Title 24, Part 2
- 2016 California Electrical Code, Title 24, Part 3
- 2016 California Mechanical Code, Title 24, Part 4
- 2016 California Plumbing Code, Title 24, Part 5
- 2016 California Fire Code, Title 24, Part 9
- 2016 California Standards Code, Title 24, Part 12
- 2016 California Title 24, Energy Conservation Standards

- C. Additional Reference Standards:

- AABC – Associated Air Balance Council
- AMCA – Air Moving and Conditioning Association
- AHRI – Air Conditioning, Heating and Refrigeration Institute
- ASHRAE – American Society of Heating, Refrigeration and Air Conditioning Engineers
- ASME – American Society of Mechanical Engineers
- ASTM – American Society of Testing Materials
- NEMA – National Electrical Manufacturer’s Association
- NFPA – National Fire Protection Association Standards
- PDA – Plumbing and Drainage Institute
- UL – Underwriters Laboratories

- D. Codes and ordinances having jurisdiction over Work are minimum requirements; but, if Contract Documents indicate requirements, which are in excess of those minimum requirements, then requirements of the Contract Documents shall be followed. Should there be any conflicts between Contract Documents or codes or any ordinances having jurisdiction, report these to the Owner.
- E. Obtain permits and request inspections from authority having jurisdiction.

1.6 PROJECT AND SITE CONDITIONS



- A. The arrangement of, and connection to, equipment shown on the Drawings is based upon information available and is not intended to show exact dimensions peculiar to a specific manufacturer. The Mechanical Drawings are, in part, diagrammatic and some features of the illustrated equipment installations may require revision to meet actual equipment installation requirements. Structural supports, housekeeping pads, piping connections, and adjacent equipment may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions or alterations.
- B. Examine all Drawings and Specifications to be fully cognizant of all work required under this Division.
- C. Examine site related work and surfaces before starting work of any Section.
- D. Install Work in locations shown on approved Drawings, unless prevented by Project conditions.
- E. Prepare revised shop drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission from the Owner before proceeding.
- F. Beginning work of any Section constitutes acceptance of conditions.

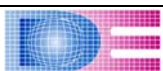
1.7 COOPERATION WITH WORK UNDER OTHER DIVISIONS

- A. Cooperate with other trades to facilitate general progress of Work. Allow all other trades every reasonable opportunity for installation of their work.
- B. Work under this Division shall follow general building construction closely. Set pipe sleeves and inserts and verify that openings for chases and pipes are provided.
- C. Work with other trades in determining exact location of outlets, pipes, and pieces of equipment to avoid interference with lines required to maintain proper installation of Work.
- D. Make such progress in the Work to not delay work of other trades.
- E. Mechanical Work shall have precedence over the other in the following sequence:

- Soil and waste piping
- Hydronic piping
- Ductwork
- Fire sprinkler piping
- Domestic water piping

1.8 DISCREPANCIES

- A. The Contractor shall check all Drawings and shall promptly notify the Owner of any discrepancies. Figures marked on Drawings shall, in general, be followed in preference to scale measurements. Piping and instrumentation diagrams shall, in general, govern floor plans and sections. Large scale drawings shall, in general, govern small scale drawings. Also, see Contract General Conditions.
- B. Where requirements between Drawings and Specifications conflict, the more restrictive provisions shall apply. Also, see Contract General Conditions.



- C. If any part of the Specifications or Drawings appears unclear or contradictory, apply to Owner for interpretation and decision as early as possible, including during bidding period. Beginning work of any Section constitutes acceptance of conditions.

1.9 CHANGES

- A. The Contractor shall be responsible to make and obtain approval from the Owner for all necessary adjustments in piping and equipment layouts as required to accommodate the relocations of equipment and/or devices, which are affected by any approved authorized changes or Product substitutions. All changes shall be clearly indicated on the "Record" drawings.

1.10 SUBMITTALS

- A. Refer to Division 01 for additional requirements.
- B. The manufacturer, contractor, or supplier shall include a written statement that the submitted equipment, hardware, or accessory complies with the requirement of that particular specification section.

The manufacturer shall resubmit the specification section showing compliance with each respective paragraph and specified items and features in that particular specification section.

All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

- C. Note that prior to acceptance of shop drawings for review, a submittal schedule shall be submitted to the Owner.
- D. Submit all Division 23 shop drawings and product data grouped and referenced by the specification technical section numbers in one complete submittal package.
- E. Shop Drawings:

Provide all shop drawings in latest version of AutoCAD format. FTP upload is acceptable.

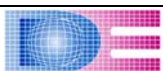
Drawings shall be a minimum of 8.5 inches by 11 inches in size with a minimum scale of ¼ inch per foot, except as specified otherwise.

Include installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to assure a coordinated installation.

Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

If equipment is disapproved, revise drawings to show acceptable equipment and resubmit.

- F. Whenever more than one manufacturer's product is specified, the first named product is the basis of design used in the Work and the use of alternate named manufacturer's products or substitutes may require modifications in that design.
- G. Proposed Products List: Include Products as required by the individual section in this Division.



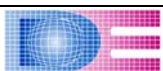
- H. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Owner bearing a stamp of "Reviewed." All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment be removed from the job site at the request of the Owner without additional compensation.
- I. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, certified equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.
- J. Standard Compliance: When materials or equipment provided by the Contractor must conform to the standards of organizations such as American National Standards Institute (ANSI) or American Water Works Association (AWWA), submit proof of such conformance to the Owner for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptance testing and is approved by the Owner. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.
- K. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.
- L. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this Contract. Pre-printed certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as," or "achieve the same end use and results as materials formulated in accordance with the referenced publications," or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

1.11 PRODUCT ALTERNATIVES OR SUBSTITUTIONS

- A. Refer to General Conditions and Division 01 for additional requirements

1.12 POSTED OPERATING INSTRUCTIONS

- A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel.
- B. The operating instructions shall include control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment.



Provide weather-resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.13 MANUFACTURER'S RECOMMENDATION

- A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.14 DELIVERY AND STORAGE

- A. Refer to Division 01 for additional requirements.
- B. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations. Replace damaged or defective items with new items.

1.15 EXTRA MATERIALS

- A. Refer to Division 01 for additional requirements.
- B. Unless otherwise specified, spare parts, wherever required by detailed specification sections, shall be stored in accordance with the provisions of this paragraph. Spare parts shall be tagged by project equipment number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate). Spare parts subject to deterioration, such as ferrous metal items and electrical components, shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping. Spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box with a hinged wooden cover and locking hasp. Hinges shall be strap type. The box shall be painted and identified with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts." A neatly typed inventory of spare parts shall be taped to the underside of the cover.

PART 2 - PRODUCTS – Not Applicable

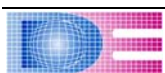
PART 3 - EXECUTION

3.1 GENERAL

- A. Obtain and pay for all permits and inspections, including any independent testing required to verify standard compliance, and deliver certificates for same to the Owner.

3.2 WORK RESPONSIBILITIES

- A. The Mechanical Drawings indicate diagrammatically the desired locations or arrangement of piping, equipment, etc., and are to be followed as closely as possible.



Proper judgment must be exercised in executing the work to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions

- B. The Contractor is responsible for the correct placing of Work and the proper location and connection of Work in relation to the work of other trades. Advise appropriate trade as to locations of access panels.
- C. In the event that changes in the indicated locations or arrangements are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, providing the change is ordered before the ductwork, piping, etc., and work directly connected to same is installed and no extra materials are required.
- D. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.
- E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc., with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.
- F. Should any changes to the Work indicated on the Drawings or described in the Specifications be necessary in order to comply with the above requirements, notify the Owner immediately and cease work on all parts of the contract, which are affected until approval for any required modifications to the construction has been obtained from the Owner.
- G. Be responsible for any cooperative work, which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such changes shall be under direction of the Owner and shall be made to his satisfaction. Perform all Work with competent and skilled personnel.
- H. All work, including aesthetic as well as mechanical aspects of the Work, shall be of the highest quality consistent with the best practices of the trade.
- I. Replace or repair, without additional compensation, any Work which, in the opinion of the Owner, does not comply with these requirements.

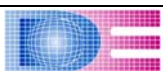
3.3 PAINTING

A. Factory Applied:

Mechanical equipment shall have factory applied painting systems which shall, at a minimum, meet the requirements of NEMA ICS 6 corrosion resistance test. Refer to individual sections of this Division for more stringent requirements.

B. Field Applied:

Paint all mechanical equipment as required to touch up, to match finish on other equipment in adjacent spaces or to meet safety criteria



END OF SECTION 23 0000



SECTION 23 0913

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Network based Thermostats.

C. Related Sections:

1. Division 23 Section, Common HVAC Requirements.
2. Division 26 Section, Electrical service and distribution.

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section, General Requirements for the list of applicable regulatory requirements.
4. Refer to Division 23 Section, Common Results for HVAC for codes and standards, and other general requirements.

B. American National Standards Institute (ANSI):

1. ANSI/NFPA 101 – Life Safety Code.
2. ANSI/NFPA 70 – National Electrical Code.

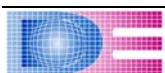
C. Underwriters Laboratories, Inc. (UL).

D. National Electrical Manufacturers Association (NEMA) Publications.

E. California Title 24, Non-Residential: Section 120 (Mechanical).

1.3 SUBMITTALS

- A. Submit under provisions of Division 23 Section, Common Results for HVAC and Division 01 Section, General Requirements.
- B. Provide damper shop drawings that show data such as arrangement, velocities, and static pressure drops for each system.



- C. Provide complete system drawings, wiring diagrams, and written detailed operational description of sequences, and description and engineering data on each control system component. Include sizing as requested.
- D. Samples: Submit samples for finish, color, and texture.
- E. Submit manufacturer's installation instructions.
- F. Submit warranty documentation.

1.4 QUALITY ASSURANCE

- A. Electrical components, devices, and accessories will be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

- A. Warranty Period: Five years from date of purchase.

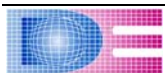
PART 2 - PRODUCTS

2.1 MANUFACTURERS (BASIS OF DESIGN)

- A. Network-based Thermostats
 - 1. Pelican Wireless Systems
 - 2. Proliphix, Inc.
 - 3. Network Thermostat
- B. Substitutions: Under provisions of Division 01 Section, General Requirements

2.2 SYSTEM REQUIREMENTS

- A. Provide control systems consisting of network-based thermostats and occupancy sensors to operate mechanical system and to perform functions specified.
- B. Provide materials and field work necessary to connect control components factory-supplied as part of equipment controlled, unless specified otherwise.
- C. Unless specified otherwise, provide fully proportional components.



2.3 THERMOSTATS (REQUIREMENT)

- A. Provide network based thermostats in each controlled zone with Fahrenheit (°F) scale, single temperature, gradual acting, and adjustable sensitivity. Provide covers with concealed setpoint adjustment, setpoint indication and with thermometer.
- B. Thermostats shall monitor room temperatures between 55 °F and 95 °F.
- C. Accuracy at calibration point: (+/-) 0.5 °F.
- D. The thermostat should have ability to communicate (bi directional) over the both wired and wireless network, integrated web server for connectivity from any modern web browser, automatic recognition of web browser resolution and formatting for specific screen sizes, and email and text message alerting for up to four recipients.
- E. Integrated weather current conditions and 7-day forecast.
- F. Thermostats shall have the ability to lock out the front panel of the thermostat, with temporary override time and temperature adjustment.

PART 3 - EXECUTION

3.1 INSTALLATION

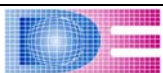
- A. Check and verify location of thermostats with plans and room details before installation. Locate thermostats 60 inches (0.9 m) above floor.
- B. Occupancy Sensor Locations: Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.
- C. Contractor is responsible for coordinating, delivery, proper storage (if necessary), installation, startup and first year of labor warranty. Installation includes replacement of missing and/or damaged materials and final connections to HVAC units.

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties.
 - 3. Test each control loop to verify stable mode of operation and compliance with sequence of operations.

3.3 DEMONSTATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel or Owner's authorized maintenance company to adjust, operate, and maintain HVAC instrumentation and controls.



PART 4 - MATERIAL SCHEDULE (Basis of Design)

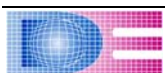
4.1 ECM M-1: NETWORK THERMOSTATS FOR HVAC CONTROL

A. Pelican Internet Programmable Thermostat TS200 (or equivalent)

1. Pelican's wireless Internet Programmable Thermostat is an affordable alternative to the wired HVAC building controls of the past. Utilizing standard thermostat to HVAC unit wiring, Pelican is able to offer a retrofit friendly thermostat that is affordable to both purchase and install in any commercial building. The Pelican thermostat is able to control up to 3 stages heat, 2 stages cool for Heat Pump systems and 2 stages heat, 2 stages cool for Conventional. It also comes with an innovative 3-wire module that allows for installations in limited wiring situations.
 - a. Seven day scheduling with up to 12 setpoints per day
 - b. Compatible with 24VAC gas, electric, or oil heating and cooling systems
 - c. Conventional and Heat Pump compatible
 - d. Voltage: 23-30VAC
 - e. 50mA power; 1.0 A running current
 - f. Setting Temperature Range – heat: 40 °F to 90 °F; cool: 50 °F to 99 °F
 - g. Differential Temperature: ± 0.5 °F
 - h. Operating Humidity Range: 5 to 90 percent

B. Proliphix Professional Series Thermostat NT 120/ NT 130 (or equivalent)

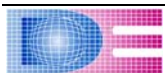
1. Proliphix Network Thermostats take full advantage of ubiquitous Ethernet networks and the Internet to utilize the converged business network for HVAC control. The Proliphix Network Thermostat product line is compatible with typical HVAC systems and offers all the features expected by commercial installers and system integrators. Internet connectivity and the thermostat's browser interface offer unprecedented ease of configuration, monitoring and management capabilities at a fraction of the cost of current programmable communicating thermostats. Proliphix thermostat is able to control up to 3 stages heat, 2 stages cool for Heat Pump systems and 2 stages heat, 2 stages cool for Conventional.
 - a. 4 periods per day, 366 Day Programming, 30 Special Day Groups
 - b. Temporary manual override
 - c. Compatible with 24VAC gas, electric, or oil heating and cooling systems
 - d. Conventional and Heat Pump compatible
 - e. Broad temperature range (40 °F to 90 °F)
 - f. Adjustable temperature offsets



C. Network Thermostats (Net/X) GE22-NX (or equivalent)

1. The GE22-NX communicating thermostats are designed for new or replacement commercial or residential conventional applications. The Net/X thermostats represent the latest in solid-state surface mount electronics and manufacturing techniques incorporated into an extremely low profile, ultra-slim white ABS plastic case. Both units offer "user-friendly" control of the heating/cooling equipment along with an easy-to-read vertical LCD that displays complete operating status. An included 2-wire communications port allows complete scheduling, remote control and status with a separate serial interface. A direct-wire, easy-to-install sub-base mounts directly on a standard vertical outlet box or any drywall surface using hardware provided.
 - a. Voltage: 20-30VAC, DC 24 nominal
 - b. Rated A.C. Current: 0.05 to 0.75 A continuous per output, with surges to 3 A maximum
 - c. Control Range – heat: 38 °F to 88 °F in 1° steps, cooling: 60 °F to 108 °F in 1° steps
 - d. Measurement Range: 28 °F to 124 °F
 - e. Control Accuracy: +/- 1 °F @ 68 °F
 - f. Minimum Deadband: (between heating and cooling) 2 °F

END OF SECTION - 23 0913



SECTION 23 5416 FURNACES

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Gas Furnaces

C. Related Sections:

1. Division 01 Section, General Requirements.
2. Division 01 Section, Special Procedures.
3. Division 03 Section, Cast-in-Place Concrete.
4. Division 23 Section, Common HVAC Requirements.
5. Division 23 Section, Instrumentation and Control Devices for HVAC.
6. Division 23 Section, Hydronic Piping for condensate piping.
7. Division 23 Section, HVAC Insulation.
8. All applicable Division 23 and 26 Sections.

1.2 REFERENCES

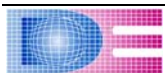
A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section, General Requirements for the list of applicable regulatory requirements.
4. Division 13 Section, Seismic Restraint Requirements for Non-Structural Components.
5. Refer to Division 23 Section, Common Results for HVAC for codes and standards, and other general requirements.

B. Code of Federal Regulations 29 CFR 1910.7 Definitions and Requirements for a Nationally Recognized Testing Laboratory (NRTL).

C. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

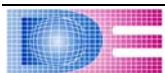
1. ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality.
2. AHSRAE/IES 90.1 Energy Standard for Building Except Low Rise Residential Buildings.
3. ASHRAE 15 Safety Standard for Refrigeration Systems.



- D. Air Conditioning, Heating and Refrigeration Institute (AHRI) certified
- E. ANSI – American National Standards Institute:
 - 1. ANSI/NFPA 101 – Life Safety Code.
 - 2. ANSI/NFPA 70 – National Electrical Code.
- F. California Title 24, Non-Residential
 - 1. California Building Code (CBC).
 - 2. California Mechanical Code (CMC).

1.3 SUBMITTALS

- A. Submit under provisions of Division 23 Section, Common Results for HVAC and Division 01 Section, General Requirements.
- B. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products
- C. Shop Drawings:
 - 1. Submit shop drawings in accordance with Section 01 33 00, Submittal Procedures.
 - 2. Indicate:
 - a. Equipment, piping and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.
 - b. Piping, valves and fittings shipped loose showing final location in assembly
 - c. Control equipment shipped loose, showing final location in assembly
 - d. Field wiring diagrams
 - e. Dimensions, internal and external construction details, installation clearances, recommended method of installation, sizes and location of mounting bolt holes
 - f. Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories, controllers.



D. QUALITY ASSURANCE

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties
2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements
3. Manufacturer's Instructions: Manufacturer's installation instructions

E. Manufacturer's Field Reports: Manufacturer's field reports specified herein

F. Closeout Submittals: Submit the following:

1. Warranty: Warranty documents specified herein
2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance. Include names and addresses of spare part suppliers.
3. Provide brief description of unit, with details of function, operation, control and component service
4. Commissioning Report: Submit commissioning reports, report forms and schematics in accordance with Section 01 81 00, Commissioning.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project
2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method

B. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings).

1.5 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements

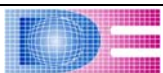
B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays

C. Packing, Shipping, Handling and Delivery:

1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact
2. Ship, handle and unload units according to manufacturer's instructions

D. Storage and Protection:

1. Store materials protected from exposure to harmful weather conditions
2. Factory shipping covers to remain in place until installation

1.6 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents
- C. Warranty: Commencing on Date of Installation.
 - 1. Aluminized Steel Heat Exchanger – 10 years in non-residential applications
 - 2. All other covered components – 1 year in non-residential applications

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Trane.
- B. Lennox.
- C. Rheem.
- D. Substitutions: Under provisions of Division 01 Section, General Requirements

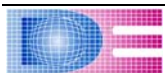
2.2 GAS FURNACE

- A. Cabinet:
 - 1. Low-profile, narrow width cabinet allows easy installation
 - 2. Heavy gauge cold rolled steel construction
 - 3. Pre-painted finish
 - 4. Flanges provided on supply air opening for ease of plenum connection or alignment with indoor coil
 - 5. Foil faced insulation on sides and back of heating compartment, mat faced insulation in blower compartment
 - 6. Gas piping inlets and electrical inlets in both sides
 - 7. Door can be removed without any tools for complete service access
 - 8. Sealed blower compartment
 - 9. Safety interlock switch to automatically shut off power to unit when blower compartment access door removed
 - 10. Inner blower compartment access panel seals air leakage
 - 11. Coil match-up

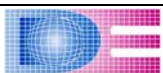


B. Heating System:

1. Heat Exchanger Assembly
 - a. Heavy gauge aluminized steel
 - b. Multi-pass crimped seam design clamshell
 - c. Secondary heat exchanger condenser coil constructed of aluminum fins fitted to stainless steel tubes
 - d. Coil is factory tested for leaks
 - e. Laboratory life-cycle tested
 - f. Condensate drain header box assembly located in front of coil
2. Header box
 - a. Collects flue condensate for disposal through drains
 - b. Drains are located on each side of cabinet
 - c. Condensate drain trap is included for field installation
3. Flue condensate trap assembly
 - a. Mounted outside the conditioned air stream on either side of cabinet in upflow and downflow applications
 - b. Mounted below the cabinet in horizontal applications (or remotely up to 5ft away from unit)
 - c. Drain cap on trap for easy cleaning and winterizing
 - d. 90 degree street elbow furnished for ease of drain trap installation
 - e. Connections can be made with field provided PVC pipe, PVC coupling, or vinyl tubing with hose clamp
4. Inshot Burners
 - a. Aluminized steel
 - b. Burner assembly removable from the unit as single component
5. Hot Surface Ignitor
 - a. Tough, reliable, long life, trouble-free performance
 - b. Silicon nitride ignitor
 - c. Ignition leads are constructed of nickel plated copper, enclosed in high temperature Teflon® insulation
 - d. Cemented to steatite block for leakage protection
6. Two-Stage Gas Control Valve
 - a. 24 V
 - b. Redundant combination
 - c. Compact Control combines manual shutoff, automatic electric valve (dual) and gas pressure regulation
7. Combustion Air Inducer



- a. Shaded pole heavy duty blower prepurges heat exchanger and safety vents flue products
- 8. Flame Rollout Switches (2)
 - a. Factory installed on burner box with manual reset for protection from abnormal operating conditions
- 9. Limit control
- 10. Pressure switch
- C. Venting
 - 1. Can be installed in Direct Vent or Non-Direct Vent applications
- D. Blower
 - 1. Direct drive blower
 - 2. Statically and dynamically balanced
 - 3. Resiliently mounted
 - 4. Easily removed for servicing
 - 5. High efficiency constant torque blower motor
 - a. ECM(Electronically Commuted Motor)
 - b. Controlled by the Integrated Furnace Control
- E. Controls
 - 1. 24 Volt Transformer
 - a. Furnished and factory installed in control box
 - b. 40VA transformer has circuit breaker wired in series
 - 2. Field Wiring Make-up Box
 - a. For line voltage wiring
 - b. Factory installed internally on left side of furnace
 - c. Box may be installed internally or externally on either



PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and [Lennox Industries] SPEC-DATA® sheets.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 INSTALLATION

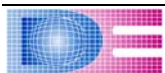
- A. Install Gas Furnace in accordance with manufacturer's instructions and regulations of authorities having jurisdiction.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect, test, and adjust field assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section, Demonstration and Training.



PART 4 - MATERIAL SCHEDULE

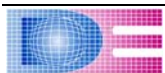
4.1 ECM M-2: CONDENSING GAS FURNACES

- A. Trane Condensing Gas Furnace (XR95 Series or equivalent)
 - 1. Input MBH: 60 MBH and 80 MBH
 - 2. AFUE: 95%
 - 3. Temperature rise: 30-60 °F
 - 4. Blower HP: 1/3 HP (60 MBH) and 3/4 HP (80 MBH)

- B. Lennox Condensing Gas Furnace (XR95 Series or equivalent)
 - 1. Input MBH: 66 MBH and 88 MBH
 - 2. AFUE: 95%
 - 3. Temperature rise: 35-65 °F (66 MBH) and 40-70 °F (88 MBH)
 - 4. Blower HP: 1/2 HP (66 MBH) and 3/4 HP (88 MBH)

- C. Rheem Condensing Gas Furnace (R98V Series or equivalent)
 - 1. Input MBH: 56 MBH and 84 MBH
 - 2. AFUE: 98.7% (56 MBH) and 98.1% (84 MBH)
 - 3. Temperature rise: 40-60 °F
 - 4. Blower HP: 1/3 HP (56 MBH) and 3/4 HP (84 MBH)

END OF SECTION 23 5416



SECTION 23 8126

SPLIT-SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Split-System Air Conditioners – outdoor condensing units

C. Related Sections:

1. Division 01 Section, General Requirements.
2. Division 01 Section, Special Procedures.
3. Division 03 Section, Cast-in-Place Concrete.
4. Division 23 Section, Common HVAC Requirements.
5. Division 23 Section, Instrumentation and Control Devices for HVAC.
6. Division 23 Section, Hydronic Piping for condensate piping.
7. Division 23 Section, HVAC Insulation.
8. All applicable Division 23 and 26 Sections.

1.2 REFERENCES

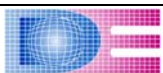
A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section, General Requirements for the list of applicable regulatory requirements.
4. Division 13 Section, Seismic Restraint Requirements for Non-Structural Components.
5. Refer to Division 23 Section, Common Results for HVAC for codes and standards, and other general requirements.

B. Code of Federal Regulations 29 CFR 1910.7 Definitions and Requirements for a Nationally Recognized Testing Laboratory (NRTL).

C. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

1. ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality.
2. AHSRAE/IES 90.1 Energy Standard for Building Except Low Rise Residential Buildings.
3. ASHRAE 15 Safety Standard for Refrigeration Systems.



- D. Air Conditioning, Heating and Refrigeration Institute (AHRI)
 - 1. AHRI 210 Performance of Unitary Air Conditioning Equipment.
 - 2. AHRI 270 Sound Performance Rating of Outdoor Unitary Equipment.
 - 3. AHRI 365 Commercial and Industrial Unitary Air Conditioning Condensing Units.
- E. American Society of Testing and Materials (ASTM) B117.
- F. ANSI – American National Standards Institute:
 - 1. ANSI/NFPA 101 – Life Safety Code.
 - 2. ANSI/NFPA 70 – National Electrical Code.

1.3 SUBMITTALS

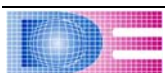
- A. Submit under provisions of Division 23 Section, Common Results for HVAC and Division 01 Section, General Requirements.
- B. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Manufacturer Seismic Certification: Certification that equipment, accessories, and components will withstand seismic forces defined in Division 23 Section, Vibration and Seismic Controls for HVAC including items as defined in Division 23 Section, Common Work Results for HVAC.
- E. Operation and Maintenance Data: For split-system air conditioning units to include in emergency, operation, and maintenance manuals
- F. Submit warranty documentation.

1.4 QUALITY ASSURANCE

- A. Equipment shall be listed or labeled by a Nationally Recognized Testing Laboratory (NRTL) recognized under 29 CFR 1910.7.
- B. Test and rate cooling systems in accordance with AHRI 210.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2016 Section 5, Systems and Equipment and Section 7, Construction and Startup.
- D. ASHRAE/IESNA 90.1-2016 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2016 Section 6, Heating, Ventilating, and Air Conditioning.
- E. Comply with ASHRAE Standard 15-2013, Safety Standard for Refrigeration Systems.
- F. Unit sound performance rating in accordance with AHRI 270.
- G. Unit will be constructed in accordance with UL standards and will carry the UL label of approval. Unit will have c-UL-us approval.
- H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

- A. Warranty of materials and workmanship as outlined in Division 23 Section, Common HVAC Requirements and Division 01 Section, General Requirements.



- B. Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air conditioning units that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years parts and compressor warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

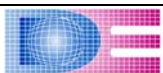
- A. Carrier
- B. Trane
- C. Goodman
- D. Substitutions: Under provisions of Division 01 Section, General Requirements

2.2 CONDENSING UNIT

- A. Unit Cabinet: Unit cabinet will be constructed of galvanized steel and coated with a powder coat paint.
- B. Fan:
 - 1. Condenser fan will be direct drive propeller type, discharging air upward.
 - 2. Condenser fan motors will be totally enclosed, 1 phase type with class B insulation and permanently lubricated bearings. Shafts will be corrosion resistant.
 - 3. Fan blades will be statically and dynamically balanced.
 - 4. Condenser fan openings will be equipped with coated steel wire safety guards.
- C. Compressor:
 - 1. Compressor will be hermetically sealed.
 - 2. Compressor will be mounted on rubber vibration isolators.
- D. Condenser Coils:
 - 1. Condenser coil will be air cooled.
 - 2. Coil will be constructed of aluminum fins mechanically bonded to copper tubes which are then cleaned, dehydrated, and sealed.
- E. Refrigeration Components:
 - 1. Refrigeration circuit components will include liquid line shutoff valve with sweat connections, vapor line shutoff valve with sweat connections, system charge of Puron (R-410A) refrigerant, and compressor oil.
 - 2. Unit will be equipped with high pressure switch, low pressure switch and filter drier for Puron refrigerant.

2.3 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Division 23 Sections, Instrumentation and Control for HVAC and Sequence of Operations for HVAC Controls.
- B. Provide low voltage, adjustable thermostat input point to control cooling operation and supply fan to maintain temperature setting.



1. Include system selector switch COOL/OFF and fan control switch ON/AUTO.
 2. Locate thermostat in room as shown on the Mechanical Drawings.
- C. Provide remote mounted fan control switch ON/AUTO.
- D. Provide in-pan condensate pump complete with piping, floats, controls, etc.

PART 3 - EXECUTION

3.1 INSTALLATION

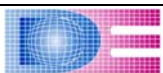
- A. Install units, level, and plumb.
- B. Install evaporator fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install compressor condenser components on 4 inch (100 mm) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section, Cast-in-Place Concrete. Coordinate anchor installation with concrete base.
- D. Install roof mounting compressor condenser components on equipment supports. Anchor units to supports with removable, cadmium plated fasteners.
- E. Install seismic restraints per site requirements as defined by Architect and/or Structural Engineer.
- F. Refer to Division 23 Section, Vibration and Seismic Controls for HVAC Piping and Equipment.
- G. Install in pan condensate pump and route discharge to nearest code approved location. Discharge to drain shall be open sight and with an air gap.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings furnished by the Contractor indicate general arrangement of piping, fittings, and specialties.
 1. Condensate Pump Connections: Comply with requirements in Division 23 Section, Hydronic Piping. Comply with disconnect requirements for power in Division 26.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section, Metal Ducts. Drawings indicate the general arrangement of ducts. Connect supply ducts to split-system air conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section, Air Duct Accessories.
- D. Ground equipment according to Division 26 Section, Grounding and Bonding for Electrical Systems.
- E. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect, test, and adjust field assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:

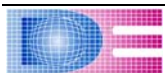


1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section, Demonstration and Training.



PART 4 - MATERIAL SCHEDULE

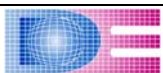
4.1 ECM M-2: SPLIT AIR CONDITIONING SYSTEM

- A. Carrier Split Outdoor Condensing Unit (CA16 Series or equivalent)
 - 1. Nominal Capacity: 3.0, 4.0, and 5.0 tons
 - 2. SEER: 16
 - 3. Refrigerant – Puron (R-410A)
 - 4. Condenser Fan Motor Size: 1/12 HP (3.0 ton) and 1/4 HP (4.0 and 5.0 ton)
 - 5. Condenser Fan Motor Speed: 1100 RPM (3.0 ton) and 800 RPM (4.0 and 5.0 ton)

- B. Goodman Split-System Outdoor Condensing Unit (GSX14 Series or equivalent)
 - 1. Nominal Capacity: 3.0, 4.0, and 5.0 tons
 - 2. SEER: 14
 - 3. Refrigerant – Puron (R-410A)
 - 4. Condenser Fan Motor Size: 1/6 HP (3.0 ton) and 1/4 HP (4.0 and 5.0 ton)

- C. Trane Split-System Cooling Outdoor Condensing Unit (GSX14 Series or equivalent)
 - 1. Nominal Capacity: 3.0, 4.0, and 5.0 tons
 - 2. SEER: 4
 - 3. Refrigerant – Puron (R-410A)
 - 4. Condenser Fan Motor Size: 1/8 HP (3.0 ton) and 1/5 HP (4.0 and 5.0 ton)

END OF SECTION 23 8126



SECTION 23 8143

AIR SOURCE UNITARY HEAT PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Wall Mount Air Source Heat Pumps.

C. Related Sections:

1. Division 01 Section, General Requirements.
2. Division 01 Section, Special Procedures.
3. Division 23 Section, Common HVAC Requirements.
4. Division 23 Section, Instrumentation and Control Devices for HVAC.
5. Division 23 Section, Hydronic Piping for condensate piping.
6. Division 23 Section, HVAC Insulation.

1.2 REFERENCES

A. General:

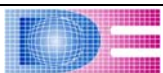
1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section, General Requirements for the list of applicable regulatory requirements.
4. Division 13 Section, Seismic Restraint Requirements for Non-Structural Components.
5. Refer to Division 23 Section, Common Results for HVAC for codes and standards, and other general requirements.

B. Code of Federal Regulations 29 CFR 1910.7 Definitions and Requirements for a Nationally Recognized Testing Laboratory (NRTL).

C. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

1. ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality.
2. AHSRAE/IES 90.1 Energy Standard for Building Except Low Rise Residential Buildings.
3. ASHRAE 15 Safety Standard for Refrigeration Systems.

D. Air Conditioning, Heating and Refrigeration Institute (AHRI)



1. AHRI 210 Performance of Unitary Air Conditioning Equipment.
 2. AHRI 270 Sound Performance Rating of Outdoor Unitary Equipment.
- E. American Society of Testing and Materials (ASTM)
1. ASTM B117.
 2. ASTM A653.
- F. ANSI – American National Standards Institute:
1. ANSI/NFPA 101 – Life Safety Code.
 2. ANSI/NFPA 70 – National Electrical Code.
- G. National Electrical Manufacturers Association (NEMA) Publications.
- H. California Title 24, Non-Residential: Section 120 (Mechanical).

1.3 SUBMITTALS

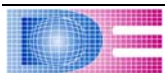
- A. Submit under provisions of Division 23 Section, Common Results for HVAC and Division 01 Section, General Requirements.
- B. Product Data: Manufacturer’s installation instructions, descriptive literature, operating instructions, and maintenance and repair data.
- C. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required cooling and heating capacities EER and HSPF values as applicable.
- D. Manufacturer Seismic Certification: certification that equipment, accessories, and components will withstand seismic forces defined in Division 23 Section, Vibration and Seismic Controls for HVAC including items as defined in Division 23 Section, Common Work Results for HVAC.
- E. Submit warranty documentation.

1.4 QUALITY ASSURANCE

- A. Equipment shall be listed or labeled by a Nationally Recognized Testing Laboratory (NRTL) recognized under 29 CFR 1910.7.
- B. Test and rate cooling systems in accordance with AHRI 210.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2016 Section 5, Systems and Equipment and Section 7, Construction and Startup.
- D. ASHRAE/IESNA 90.1-2016 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2016 Section 6, Heating, Ventilating, and Air Conditioning.
- E. Comply with ASHRAE Standard 15-2013, Safety Standard for Refrigeration Systems.
- F. Unit sound performance rating in accordance with AHRI 270.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

- A. Warranty of materials and workmanship as outlined in Division 23 Section, Common HVAC Requirements and Division 01 Section, General Requirements.
- B. Provide five year Refrigerant Compressor warranty and one year Parts warranty.



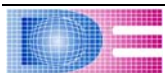
PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Mavair
- B. Bard
- C. Substitutions: Under provisions of Division 01 Section, General Requirements

2.2 AIR SOURCE UNITARY HEAT PUMPS

- A. General: Heat pump units shall be type, size, and configuration indicated. Designed for outdoor wall mount installation.
- B. Unitary heat pumps shall bear the United States Environmental Protection Agency, Energy Star label and shall have a minimum Coefficient of Performance (COP) of 3.0 and a minimum Energy Efficiency Ratio (EER) of 11, at full load. The new heat pump shall feature minimum of 2 stage compressor and minimum integrated part load value (IPLV) of 14.
- C. The exterior cabinet shall be constructed of 20 gauge zinc-coated, galvanized G60 steel with a satin beige polyester finish and shall meet the corrosion protection requirements of ASTM standard A653. The finish shall be highly resistant to abrasion, metal marking, staining, pressure mottling, and require minimal maintenance. The cabinet shall include a sloped top and built-in mounting flanges. The conditioned air section shall be insulated with 1/2 inch, 2 pound c density fiberglass.
- D. Filters: One inch filament spun glass type filter shall be mounted internally, factory supplied, and accessible through an external panel.
- E. Compressor and Refrigerant Circuit: The compressor shall be a hermetic scroll type with vibration isolation. The refrigeration circuit shall contain a filter dryer and a fixed metering device. The refrigeration circuit shall include a high pressure switch and a loss of charge switch with a lockout relay. The compressor motor shall be protected by an internal line break thermostat. Electrical wiring connections at the compressor shall be protected by molded plug.
- F. Outdoor Section:
 - 1. The outdoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes.
 - 2. Outdoor fan shall be direct driven, propeller type for quiet operation. The outdoor motor shall be equipped with a thermal protector. The condenser shall be horizontal discharge design with a heavy duty vinyl coated wire coil guard.
 - 3. HVAC out door protective cage: The metal cage will fully enclose the modular wall mounted heat pump unit. Cage front should swing open on hinges for maintenance access and should be secured with padlocks. The cage should be coated in industrial black powder-coated finish.
- G. Indoor Section:
 - 1. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes.



2. The indoor blower motor shall be an electronically commutated type motor. The motor's control shall be encapsulated to prevent water from reaching its electronic components. The motor shall automatically deliver constant airflow over a wide range of external static pressures by changing its torque and speed without external sensors. The motor shall be factory programmed to slowly ramp up the speed to eliminate the abrupt change in sound when the motor starts.
3. The evaporator drain pan shall be sloped for proper drainage.

H. Accessories:

1. Economizer shall be field / factory installed; and shall include fully modulating 0-100 percent motor and dampers, barometric relief, and dry bulb and/or enthalpy controls.

2.3 OPERATING CONTROLS

- A. Provide low voltage, adjustable thermostat input point to control heating/cooling operation and supply fan to maintain temperature setting.
 1. Include system selector switch HEAT/COOL/OFF and fan control switch ON/AUTO.
 2. Locate thermostat in room as shown on the Drawings.
- B. Provide remote mounted fan control switch ON/AUTO.

PART 3 - EXECUTION

3.1 INSPECTION

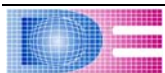
- A. Examine areas and conditions under which units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide adequate bracing and vibration isolation in accordance with seismic code requirements.
- C. Provide adequate drainage connections and routing for condensate.
- D. Contact manufacturer to review installation procedures for all field installed accessories.
- E. Line and control voltage connections shall be made to the appropriate terminals within the heat pump's control box.
- F. All external control devices shall be wired to the appropriate terminals within the heat pump's control box.
- G. Perform all miscellaneous wiring not specifically shown on the Electrical Drawings in order that all field installed accessories operate in accordance with the manufacturer's intentions.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect, test, and adjust field assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:



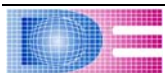
1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

PART 4 - MATERIAL SCHEDULE

4.1 ECM M-3: WALL-MOUNT HEAT PUMPS

- A. Mavair Wall Mount Heat Pumps (HVPSA Series or equivalent) – 3 Tons and 4 Tons (Respectively)
1. Cooling System Capacity, Efficiency and Airflow Ratings
 - a. Cooling Capacity: 35,000 BTUH; 39,000 BTUH; and 47,000 BTUH
 - b. EER 2 Stage Operation: 11.00 for all units
 - c. Airflow: 1,200 CFM; 1,300 CFM; and 1,750 CFM
 2. Heating Capacity, Efficiency and Airflow Ratings
 - a. High Temperature Heating Capacity: 31,400 BTUH; 37,600 BTUH; and 39,000
 - b. High Temperature COP: 3.20; 3.15; and 3.0
 - c. Airflow: 1,200 CFM; 1,300 CFM; and 1,750 CFM
- B. Bard Wall Mount Heat Pumps (T36S1; T42S1; and T48S1 Series or equivalent)
1. Cooling System Capacity, Efficiency and Airflow Ratings
 - a. Cooling Capacity: 33,800 BTUH; 39,500 BTUH; and 46,500 BTUH
 - b. EER 2 Stage Operation: 11.0 for all units
 - c. IPV: 14.7; 14.6; 15.0
 - d. Airflow: 1,100 CFM; 1,250 CFM; and 1,550 CFM
 2. Heating Capacity, Efficiency and Airflow Ratings
 - a. High Temperature Heating Capacity: 20,000 BTUH; 23,000BTUH; and 27,000 BTUH
 - b. High Temperature COP: 3.40; 3.30; and 3.50
 - c. Airflow: 1,100 CFM; 1,250 CFM; and 1,550 CFM

END OF SECTION 23 8143



SECTION 26 0160 ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Removal of existing electrical feeders, receptacles, electrical conduits/conductors associated with mechanical equipment intended to be demolished or replaced.
2. Contractor shall provide electrical demolition required for work noted on drawings.
3. The Contractor shall dispose of demolished electrical equipment as directed by the Owner. The Owner has first right of refusal for all equipment including copper cabling.

1.2 REFERENCES

A. Environmental Protection Agency (EPA) Regulations:

1. 40 CFR 261, Identification and Listing of Hazardous Waste.
2. 40 CFR 263, Standards Applicable to Transporters of Hazardous Wastes.
3. Hazardous Waste Facilities.

B. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Regulation:

1. 29 CFR 1910 Subpart G, Occupational Health and Environmental Control.

C. Department of Transportation (DOT):

1. 49 CFR 178, Regulations for Shipping Container Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

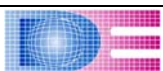
- A. Materials and equipment for patching and extending work: As specified in individual Sections, if applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION



- A. Disconnect electrical systems in and under walls, concrete, and structures scheduled for removal.
- B. Coordinate electrical outages with the Facility.
- C. Provide temporary wiring and connections to maintain existing systems in-service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish existing electrical work under provisions of this Section and as indicated on the drawings.
- B. Remove abandoned wiring to source of supply unless otherwise indicated.
- C. Remove exposed abandoned conduit. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect and remove abandoned distribution equipment.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.4 CLEANUP AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.

END OF SECTION 26 0160

