

**WATER HEATER AND FURNACE REPLACEMENT**

**October 25, 2021**

**PROJECT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. The general scope of work for this project shall include:
  - a. 10 units are to be renovated.
  - b. Provide per unit price.
  - c. Provide and install new, tankless, electric water heaters in existing mechanical space.
  - d. Provide and install new, ground mounted furnace and exterior condensing unit.
  - e. Connect to existing supply ductwork in attic. Install new return grille in mechanical room sidewall..
  - f. Remove and proper dispose of existing equipment.
  - g. Disconnect and reconnect electrical wiring.
  - h. Disconnect and reconnect gas piping.
  - i. Disconnect and reconnect to existing water piping in mechanical space.
  - j. Installing new intake and relief PVC flue piping to new concentric vent in exterior wall or roof for new furnaces.

**1.02 REGULATORY REQUIREMENTS**

- A. All work shall be executed and inspected in accordance with all local and state codes, laws, ordinances, rules and regulations applicable to the particular class of work. The Contractor shall include in his quotation all applicable service charges, fees, permits, royalties, and other similar costs in connection with the work. If, to the knowledge of the Contractor, the drawings and specifications are in conflict with the above, he shall promptly notify the engineer in writing so that necessary changes can be provided for in his contract. If the contractor performs any work without notice as required, he shall bear all the costs of corrective action.
- B. The Contractor shall obtain permits, and request inspections from authority having jurisdiction.

**1.03 SUBMITTALS**

- A. Install work in locations as indicated in specification, unless prevented by Project conditions. The Contractor shall make use of all data in all of the contract documents and shall verify all information at the site prior to start of construction.
- B. The Contractor shall verify the exact location of each unit as necessary and existing conditions.

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- C. The Contractor shall provide a submittal to the owner for approval prior to the procurement for:
  - 1. Electric water heater – Eemax HA018240
  - 2. Furnace/Condensing unit – Trane TUH1B040/4TTR4018
  - 3. Or equivalent as noted below.

**1.04 GUARANTEE**

- A. Contractor shall guarantee all work performed under this contract to be free from defects in materials and workmanship for a period of one year from date of witnessed and approved startup.
- B. Refer to individual specification sections and drawings for additional guarantees and equipment warranty requirements.

**PART 2 PRODUCTS**

**2.01 MOTORS**

- A. Motors for all Division 15 equipment shall be furnished by suppliers of such equipment and shall be the type that has characteristics suitable for continuous operating conditions. Motors shall consist of NEMA frame construction, 40 degrees C temperature rise, suitable for the available electric current characteristics, and have quiet operating bearings.

**2.02 TEMPERATURE CONTROL WIRING**

- A. All temperature control wiring shall be furnished and installed by this division in accordance with all local codes and ordinances. All installations shall be in accordance with manufactures recommendations for connected devices. All temperature control wiring shall be in conduit when exposed.

**2.03 TRANSPORTATION AND HANDLING**

- A. Transport and handle Products in accordance with manufacture instructions.
- B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct and Products are undamaged.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

**2.04 STORAGE AND PROTECTION**

- A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible.
- B. Store sensitive Products in weather tight, climate controlled enclosures.
- C. For exterior storage of fabricated Products, place on sloped supports, above ground.

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- D. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product.

**2.05 PRODUCT OPTIONS**

- A. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit request for substitution for any manufacturer not named.

**2.06 SUBSTITUTIONS**

- A. Product may be substituted in place of specified products as long as the substituted product meets or exceeds the specified product basis and is approved by the owner.

**PART 3 EXECUTION**

**3.01 EQUIPMENT REPLACEMENT**

- A. All work performed by this section shall utilize craftsman with a demonstrated ability to perform the specific work required.
- B. All work performed by this section shall be by a contractor licensed in the State of Kentucky for this class of work.
- C. All work shall be coordinated with owner. Construction activities shall not begin and existing units shall not be disabled without owner's approval. Contractor shall, generally, only disable the existing units at the time that the replacement equipment is ready to install.
- D. Existing electrical at equipment shall be disconnected and wiring extended to new equipment locations. Contractor shall verify capacity of existing electrical service prior to installation and remove any unused breakers. Natural gas piping and control wiring shall be disconnected and extended to new furnace/thermostat location. Provide dirt leg and accessible shutoff valve in mechanical room.
- E. Provide and install new, non-programmable thermostat.
- E. Remove existing equipment, unused combustion air ducts and unused flue piping. Cap unused flues through roof. Cap any unused water piping.
- F. Install new water heater in mechanical closet. Maintain manufacturers recommended clearances. Install new water heater such that the new furnace can be installed next to short wall with the new return grille.
- G. Connect to existing water piping.
- H. Install new furnace in existing mechanical closet. Extend supply duct through ceiling to existing ductwork in attic. Install new 20x20 filter return grille in low sidewall of mechanical

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room and connect via fully lined duct/plenum to furnace. All new duct shall have min R-8 insulation and shall be sealed properly. Permanently seal existing ceiling return opening.

- I. Provide little giant condensate pump. Route discharge to existing laundry box in mechanical room. Provide auxiliary drain pan with float switch.
- J. Contractor shall install new intake and relief PVC flue piping through roof/wall to concentric intake for new condensing furnace.
- K. Existing refrigerant piping may be reused if in acceptable condition. Contractor shall inspect prior to construction and replace as required. Reinsulate all refrigerant piping as required.
- L. Install new condensing unit on formed in place concrete pad. Preformed pads are not acceptable.

**3.02 CAPACITIES**

- A. Provide a per unit price to replace existing equipment

**END OF SECTION**

**DOMESTIC WATER HEATERS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Water heaters.
  - 2. Accessories.

**1.02 REFERENCES**

- A. American National Standards Institute (ANSI) Publications:
  - 1. Z21.22 "Relief Valves for Hot Water Supply Systems"
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Publications:
  - 1. 90.1 "Energy Code for Commercial and High-Rise Residential Buildings"
  - 2. 90.2 "Energy Code for New Low-Rise Residential Buildings"
- C. The American Society of Mechanical Engineers (ASME) Publications:
  - 1. "(The 2004) ASME Boiler and Pressure Vessel Code"
  - 2. B1.20.1 "Pipe Threads, General Purpose, Inch"
  - 3. B16.5 "Pipe Flanges and Flanged Fittings: NPS 1/2 through 24"
  - 4. B16.24 "Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500 and 2500"
- D. American Society of Sanitary Engineering (ASSE) Publications:
  - 1. 1017 "Performance Requirements for Temperature Actuated Mixing Valves for Hot Water"



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Distribution Systems"

E. Canadian Standards Association (CSA) Publications:

1. B125.1 "Plumbing Supply Fittings"

F. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

G. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A "Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors"

2. 486B "Standard for Wire Connectors for Use With Aluminum Conductors"

3. 778 "Standard for Motor-Operated Water Pumps"

4. 795 "Standard for Commercial-Industrial Gas Heating Equipment"

**1.03 SUBMITTALS**

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" indicating specified items selected for use in project with the following supporting data.

1. Product Data:

a. For each type and size of water heater, include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

b. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.

2. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.

3. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 01.

4. Warranties: Special warranties specified in this Section.

**1.04 QUALITY ASSURANCE**

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 01.

E. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:  
1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.

**1.05 WARRANTY**

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

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- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Approved Manufacturers
  - 1. Electric Water Heaters: (Tankless Type)
    - a. Eemax
    - b. Rheem
    - c. Bosch

#### **2.02 WATER HEATER ACCESSORIES**

- A. Water Heater Stands: not used
- B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
- C. Drain Pans: not used
- D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

### **PART 3 - EXECUTION**

#### **3.01 WATER HEATER INSTALLATION**

- A. Install commercial water heaters on concrete bases.
  - 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.
- E. Install thermometer on outlet piping of water heaters.
- F. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- G. Fill water heaters with water.

#### **3.02 CONNECTIONS**

- A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

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- B. Ground equipment according to NEC 2017
- C. Connect wiring according to NEC 2017

**3.03 FIELD QUALITY CONTROL**

- A. Perform the following field tests and inspections:
  - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

**3.04 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters.

**END OF SECTION**

**FORCED AIR FURNACES**

**PART 1 - GENERAL:**

**1.01 WORK INCLUDES:**

- A. Forced air furnaces.
- B. Refrigerant cooling coils
- C. Controls.

**1.02 RELATED WORK:**

- A. Not used

**1.03 REFERENCES:**

- A. ARI 210/240-89 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
- B. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
- C. ARI 520 - Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units.
- D. Not used

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- E. ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.
- F. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- G. ASHRAE 90A - Energy Conservation in New Building Design.
- H. ASHRAE 103 - Heating Seasonal Efficiency of Central Furnaces and Boilers, Methods of Testing.
- I. NEMA MG 1 - Motors and Generators
- J. NFPA 31 - Installation of Oil Burning Equipment.
- K. NFPA 54 (AGA Z223.1) - National Fuel Gas Code.
- L. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- M. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
- N. UL207 - Refrigerant-Containing Components and Accessories, Non-electrical.
- O. UL303- Refrigeration and Air-Conditioning Condensing and Compressor Units.

**1.04 SUBMITTAL FOR REVIEW:**

- A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

**1.05 SUBMITTALS AT PROJECT CLOSEOUT:**

- A. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- B. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

**1.06 QUALITY ASSURANCE:**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience approved by manufacturer.

**1.07 REGULATORY REQUIREMENTS:**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.08 WARRANTY:**



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- A. Provide five year manufacturers warranty for heat exchangers.
- B. Provide three year manufacturers warranty for solid state ignition modules.

**PART 2 - PRODUCTS:**

**2.01 GAS FIRED FURNACES:**

- A. Trane, Rheem, Carrier
- B. Other acceptable manufacturers offering equivalent products.
- C. Units: Self-contained, packaged, factory assembled pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, and accessories; wired for single power connection with control transformer.
  - 1. Air Flow Configuration: Upflow
  - 2. Heating: 95%+ efficient condensing Natural gas fired.
  - 3. Electric Refrigeration: Refrigerant cooling coil and outdoor package containing compressor, condenser coil and condenser fan.
- D. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- E. Supply Fan: Centrifugal type rubber mounted with direct or belt drive.
- F. Motor: multiple speed, permanently lubricated, hinge mounted.
- G. Gas Burner:
  - 1. Gas valve, provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (on-off), automatic electric valve.
  - 2. Electronic pilotless ignition, with electric spark plug.
  - 3. Non-corrosive combustion air blower with permanently lubricated motor.
- H. Gas Burner Safety Controls:
  - 1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven, combustion chamber has been proven and stops gas flow on ignition failure.
  - 2. Flame rollout switch: Installed on burner box and prevents operation.
  - 3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
  - 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- I. Operating Controls:

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1. Room Thermostat: Cycles burner to maintain room temperature setting (heating). Cycles blower and air cooled condensing unit to maintain room temperature setting (cooling). Provide non-programmable thermostat.
  2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.
- J. Air Filters: 1 inch thick glass fiber, disposable type arranged for easy replacement. Filter mounting channels integral with unit. Verify details with owner.
- K. Performance:
1. Ratings: Energy Efficiency Rating (SEER) not less than 14
  2. Refer to Furnace Schedule. 95% +. Gas heating capacities are sea level ratings.
  3. Air Handling: Refer to furnace schedule.
  4. Heating Capacity: Refer to furnace schedule.

**2.02 EVAPORATOR COIL UNITS:**

- A. Manufacturer: Trane, Rheem, Carrier
- B. Other acceptable manufacturers offering equivalent products:
- C. Construction and Ratings: In accordance with ARI 210/240 and UL 207 and UL 303.
- D. Evaporator Coil: Copper tube aluminum fin assembly, galvanized drain pan, drain pan, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve, steel cabinet with baked enamel finish and insulation.

**PART 3 - EXECUTION:**

**3.01 EXAMINATION:**

- A. Verify that floors are ready for installation of units.
- B. Verify that proper power supply is available for furnace.
- C. Verify that proper fuel supply is available for connections.

**3.02 INSTALLATION:**

- A. Install in accordance with NFPA 90A and NFPA 90B.
- B. Install gas fired furnaces in accordance with ANSI Z223.1 and NFPA 54.
- C. Install refrigeration systems in accordance with ASHRAE 15.
- D. Pipe drain from cooling coil.

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**END OF SECTION**

**AIR COOLED CONDENSING UNITS**

**PART 1 - GENERAL:**

**1.01 WORK INCLUDES:**

- A. Condensing unit package
- B. Charge of refrigerant and oil
- C. Controls and control connections.
- D. Refrigerant piping connections.
- E. Motor starters.
- F. Electrical power connections.

**1.02 RELATED WORK:**

Not used

Not used

**1.03 REFERENCES:**

- A. AIR 270 - Sound Rating of Outdoor Unitary Equipment
- B. ARI 365 - Commercial and Industrial Unitary Air-Conditioning Condensing Units.
- C. ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.
- D. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- E. ASHRAE 90A - Energy Conservation in new Building Design.
- F. NEMA MG 1 - Motors and Generators.
- G. UL 207 - Refrigerant Containing Components and Accessories, Non-electrical.
- H. UL 303 - Refrigeration and Air-Conditioning Condensing, and Air-Source Heat Pump Equipment.

**1.04 SUBMITTALS FOR REVIEW**

- A. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. Make submission with furnace units.

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**1.05 SUBMITTALS AT PROJECT CLOSE-OUT**

- A. Operation and Maintenance Data: Include start-up instructions, maintenance instructions, parts lists, controls, and accessories.

**1.06 REGULATORY REQUIREMENTS:**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.07 DELIVERY, STORAGE AND PROTECTION:**

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- B. Protect units on site from physical damage. Protect coils.

**1.08 WARRANTY**

- A. Provide a five year warranty to include coverage for refrigerant compressors.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Air Cooled Condensing Units
  - 1. Trane
  - 2. Other Acceptable Manufacturers:
    - a. Carrier
    - b. Rheem

**2.02 MANUFACTURED UNITS:**

- A. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinets, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, and screens.
- B. Construction and Ratings: In accordance with ARI 210/240-89 and 270-84. Testing shall be in accordance with ASHRAE 14.
- C. Performance Ratings: Energy Efficiency Rating (SEER) not less than 14.

**2.03 CASING**

- A. House components in galvanized steel panels with weather resistant, baked enamel finish.



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- B. Mount starters, disconnects, controls and transformers in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.
- C. Provide removable access doors or panels with quick fasteners.

**2.04 CONDENSER COILS:**

- A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig.
- B. Coil Guard: Expanded metal with lint screens.

**2.05 FANS AND MOTORS:**

- A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge.
- B. Weatherproof motors suitable for outdoor use, with permanent lubricated ball bearings and built in current and thermal overload protection.

**2.06 COMPRESSORS**

- A. Compressor: hermeticing type.
- B. Mounting: Statically and dynamically balance rotating parts and mount on vibration isolators.

**2.07 CONTROLS:**

- A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, factory wired with single point power connection.
- B. Provide safety controls arranged so any one will shut down machine:
  - 1. High discharge pressure switch (automatic reset) for each compressor.
  - 2. Low suction pressure switch (automatic reset) for each compressor.

**PART 3 - EXECUTION**

**3.01 INSTALLATION:**

- A. Install in accordance with manufacturer's installation instructions.
- B. Complete mechanical and electrical connections in accordance with manufacturer's installation instructions.
- C. Provide for connection to electrical service.
- D. Provide connection to refrigeration piping system and evaporators. Comply with ASHRAE 15.

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- E. Furnish charge of refrigerant and oil.

**3.02 DEMONSTRATION AND INSTRUCTIONS:**

- A. Supply initial charge of refrigerant and oil for each refrigerant system. Replace losses of oil or refrigerant prior to end of correction period.
- B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.
- C. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.

**END OF SECTION**