December 4, 2024

REQUEST FOR PROPOSAL FOR
COMMISSIONING SERVICES
For the

East Montpelier Town Garage
Templeton Road
East Montpelier 05651

CONTENTS

SCHEDULE FOR RFP

- RFP posted 5 Dec 2024: https://eastmontpeliervt.org/wp-content/uploads/2024/11/EM-Town-Garage-Commissioning-RFP-241204.pdf
- Deadline for questions via email **13 December 2024**
- Addendum (if any) shall be issued on **17 December 2024** via email
- Deadline for receipt of proposals via email 23 **December 2024**

CONTACT FOR QUESTIONS

Jennifer Devine, Town administrator
manager@eastmontpeliervt.org

REQUEST FOR PROPOSALS FOR
COMMISSIONING SERVICES

GENERAL

The Town of East Montpelier is seeking the services of a qualified firm to act as the commissioning authority (CA) for the Town of East Montplier new Town Garage building. The CA will contract directly with the Town of East Montpelier.

The project team includes:

Owner:	**Town of East Motnpelier**
Architect:	**William Lamphere Architects, David Roy, John LaMothe**
Mechanical & Electrical Engineer(ME):	**Engineering Services of Vermont**
Construction Manage(CM):	**TBD**
Mechanical Contractor(MC):	**TBD**
Electrical Contractor (EC):	**TBD**
Controls Contractor(CC):	**TBD**
Testing & Balancing Contractor(TAB):	**TBD**

Abbreviations used in this document are:

BECx = Building Enclosure Commissioning Authority
Cx = Commissioning Authority
CC = Controls Contractor
CM = Construction Manager
CX = Commissioning
EC = Electrical Contractor
MC = Mechanical Contractor
ME = Mechanical & Electrical Engineer
RFP = Request for Proposal
TAB = Testing & Balancing Contractor

PROJECT DESCRIPTION

The project encompasses approximately 9,000 sq.ft. of new construction

PROJECT SCHEDULE

The proposed project schedule is as follows: **See Attachment**

PART ONE: GENERAL SCOPE OF WORK

A. General Description of Commissioning Activity:

The Owner is committed to commissioning this facility to ensure that all systems are complete and functioning properly upon occupancy and that facility staff has adequate system documentation and training. Commissioning consists of systematically documenting the proper installation and start-up of specified components and systems, as well as testing those components and systems to verify and document proper operation through all modes and conditions. In addition, Owner-personnel training will be verified and final project operations and maintenance (O&M) documents will be reviewed for completeness. The CA shall review commissioning related reports and documents submitted by the Contractors to verify that they are complete and satisfy the requirements of the Contract Documents. The CA shall work cooperatively with the ME and will coordinate with all parties as needed, recognizing the need for advance planning of on-site meetings and activities. The CA scope of work shall include, but shall not be limited to the following:

1. Reviewing the Construction Documents. This shall include reviewing the design requirements; the ME design assumptions such as occupancy, space and process requirements; applicable codes, policies, and standards; and the load and climatic assumptions utilized. Review will start at partially complete Design Development (DD) plans
2. Development of a commissioning plan. The commissioning plan shall include but not be limited to a brief overview of the commissioning process; list of all systems and assemblies included in the CA scope of work; description of the management, communication and reporting of the commissioning process; overview of the commissioning process activities for the pre-design, design, construction, and occupancy and operations phases, including development of the project requirements, review of the basis of design, schematic design, construction documents and submittals, construction phase verification, functional performance test development and implementation, and 10-month warranty review; list of expected work products; and a list of key commissioning process milestones.
3. Verify the installation, functional performance, training and operation and maintenance documentation.
4. Complete a commissioning report.

B. Systems To Be Commissioned

Refer to the project construction documents for proposed systems, size, types of equipment, and controls and for building enclosure.

HVAC Systems Description: The HVAC systems for the project include:

- Ground source Water to Water Heat Pumps (GSJHP)
- GSHP associated thermal storage tanks
- Air to air heat pump(s) (ASHP) for the office area
- Energy Recovery Ventilator in office area
- Exhaust Fans and Intakes in garage and mechanical room
- Plate and Frame Heat Exchangers
- Domestic Water Heater and Recirculation System
- Control Valves
- Control Dampers
- Pumps/Circulators
- Radiant Floor system
- All Control Systems, including sequences, sensors, and controls.

- Well pump
- Earth connected heat exchange. TBD if open or closed loop, including conductivity test if closed loop and water testing, flow and quality if open loop.
- Electrical system
- Lighting and lighting controls
- Air compressor and air service lines
- Oil separator (from floor drains)
- EGauge monitoring system (assume 20 measured points)

Building enclosure will be well insulated, air-tight wood frame with some interior steel columns and beams commissioning tasks include:

- Air tightness meets the requirements in the construction documents.
- Doors, windows, overhead doors, mechanical and electrical penetrations and any other penetrations are properly air sealed
- Insulation is properly installed and continuous, including between differing insulation systems
- Air barrier, weather resistant barrier, sub-slab vapor barrier are all properly installed and continuous from sub-slab to roof
- Louvers, sealants, control joints,
- Flashings, transitions, end dams, etc.
- Below grade construction including damp proofing
- Interface between all of the above elements

C. Level of effort expected for each commissioned system

1. The CA shall develop pre-functional and functional checklists for the Installing Contractors to include in their initial checkout and startup. The functional testing shall include operating the system and components through each of the written sequences of operation, as well as other significant modes and sequences, including startup, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure, security alarm when impacted, and interlocks with other systems or equipment. Sensors and actuators shall be calibrated during pre-functional testing by the Installing Contractors and spot-checked by the CA during functional testing. Tests on respective HVAC equipment shall be executed during both the heating and cooling season. Some overwriting of control values to simulate conditions may be allowed, however, if used judiciously and verified subsequently during actual weather conditions. Functional testing shall be completed using conventional manual methods, control system trend logs, and read-outs or stand-alone data-loggers, to provide a high level of confidence in proper system function, as deemed appropriate by the CA and the Owner.

    a. **Ventilation**: The CA shall check the physical operation of all ventilation equipment to insure that they operate properly and that all air dampers are properly positioned for all sequences. The CA shall review the Balancing Report to verify that fresh air quantities are in accordance with the Design Criteria and applicable codes.

b. **Mechanical Rooms**: The CA shall confirm that all equipment operates in accordance with the Design Criteria, including verification of proper lead/lag operation of pumps, settings of operating limits, outdoor reset schedules, and performance of other equipment.

c. **Heating and Cooling**: The CA shall check proper operation of all heat pumps, heat exchangers, control valves, and pumps.

d. **Hydronics associated with GSHP:** Proper operation of all hydronics, including but not limited to balancing report on wells/bore-holes, piping, circulators, motorized valves and radiant floor manifolds and piping

e. **Building Enclosure:** Minimum of two progress tests and one final test for air leakage, inspection of all enclosure elements prior to those being covered, verification of proper enclosure materials and installation, including but not limited to weather resistive barrier, air barrier, insulation barrier, vapor retardewrs and drainage systems. Site visits and meetings as required, including meeting with insulation, window and door installers, and air sealing subs just prior to their arriving on site for their work, and a preconstruction meeting with the whole team. Meetings shall include review of all construction details and specifications, air leakage goal and testing and inspection process.

2. The CA shall conduct a review of contractor submittals for commissioned equipment concurrently with the shop drawing/submittal review of the ME.

3. The CA shall prepare a report certifying that the systems perform as designed, and shall document any discrepancies between actual performance and the Design Criteria, including applicable code requirements. The CA shall also document proper operation after any required corrections.

4. The CA shall propose two copies of a checklist format, which shall be submitted to the Owner.

5. The CA shall verify that any corrective actions required of Contractors as a result of recommendations presented in the report and approved by the ME are properly implemented.

D. Commissioning Services during Construction and Warranty Phases

A summary of the commissioning process during construction is:

1. The CA shall review draft DD documents, draft CD documents and final CDs.

2. The Commissioning Authority (CA) develops a commissioning plan, with a schedule coordinated with the master construction schedule, to be included in the project manual.

3. The CA shall conduct a scoping meeting where the Commissioning Process is reviewed with the construction team members.

4. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, and schedule future activities and resolve problems.

5. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.

6. The CA works with the MC and CC in developing start-up plans and start-up documentation formats, including providing pre-functional checklists to the MC and CC to be completed during the startup process.

7. The checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.

8. The MC and CC, under their own direction, execute and document the pre-functional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing startup of selected equipment.

9. The CA shall develop specific equipment and system functional performance test procedures. The Subs shall review the procedures.

10. The procedures are executed by the MC and CC, under the direction of, and documented by the CA.

11. The CA shall check the operation of each control valve and control actuator. The CA shall review trend logs for all control loops and perform a real-time review of space temperature to determine if the temperature of each individual space is maintained within the design criteria. Operation of all equipment shall be visually verified, at the piece of equipment and verified that the control system readouts correspond with the actual operation. The CA shall also verify that the control system readouts correspond with the actual operation; shall document proper operation, as well as any deficiencies or deviations from the design criteria; and document proper operation after any required corrections.

12. Items of non-compliance shall be corrected by the MC and CC and the system shall be re-tested at the expense of the MC and CC.

13. The CA shall review the O&M documentation, project reports, and closeout documents for completeness by the end of the one-month occupancy period.

14. Final post-construction commissioning is completed after Substantial Completion and before occupancy.

15. The CA shall review, pre-approve, and coordinate the training provided by the MC and CC and verifies that it was completed.

16. Seasonal Commissioning: The CA shall commission each system within both the heating season and for the offices, the cooling season, and shall confirm the operation of 50 percent of each control valve and control actuator; review trend logs for all control loops, and perform a real-time review of space temperature to determine if the temperature of each individual space is maintained within the Design Criteria and the system is operating as per the sequence of operations. Operation of all equipment shall be visually verified at the location of each piece of equipment. The CA shall also verify that the control system readouts correspond with the actual operation; shall document proper operation, as well as any deficiencies or deviations from the design criteria; and document proper operation after any required corrections.

17. Post-Occupancy Check: Include a post-occupancy check-up as part of the commissioning proposal to verify how the building is actually operating at one month prior to end of one year warranty period. The CA will follow up on a list of "events" or complaints compiled by the Owner. This post occupancy checkout shall mimic the initial checkout, but shall be done from the controls console, with physical checking at each piece of equipment or zone only as needed. A one-week trend log of all control loops completed just prior to this check-up shall be included in the specifications for the CC**.** The CA, prior to the on-site checkout, shall review the trend logs. This post occupancy checkout should be completed at a different season than the initial checkout to be sure that proper operation is documented in both heating and cooling conditions.

18. CA will prepare final commissioning report outlining findings of the commissioning and any recommendations for any further action. Include, as appendices, all documents generated during commissioning. Coordinate this with closeout documentation provided by the ME to avoid duplication. Submit draft of report to Owner for approval, and incorporate any changes requested by Owner.

E. Team Cooperation

The Mechanical Contractor (MC), the Control Contractor (CC), the Balancing Contractor (TAB), the Mechanical Engineers (ME) and the Owner shall assist the CA as indicated below.

1. The Mechanical Engineer (ME) shall provide full construction documents, including design intent and full sequences of operation. The ME shall include requirements for the following in the specifications and shall submit the following reports and documents to the CA, after completion, review and revision as per the Design Engineer's final review:
    - Final Inspection List
    - Record Drawings
    - Maintenance Manual
    - Warrantees
    - Spare Parts List
    - Control System Trend Logs
    - Testing, Adjusting and Balancing Report
    - Product data
    - Submittals

2. The Mechanical Contractor (MC) shall assist the CA by facilitating access to equipment as required, including removing and replacing access panels on each piece of equipment, by removing and replacing ceiling tiles as required for inspection of piping, valves, ductwork and concealed equipment and by providing lifts and ladders to reach equipment where necessary. The MC shall assist the CA in scheduling the on-site services for the Control Contractor (CC) and the Balancing Contractor (TAB).

3. The Control Contractor (CC) shall provide on-site assistance to the CA to verify proper operation of controls/mechanical equipment, as required. The CC shall provide to the CA copies of all written materials required by the Contract Documents, including the Project Close-Out documents required in the Control System Specifications. In addition, the CC shall provide one seven-day trend log and graph for every control loop in the project. Each graph shall show the operating setpoint, controlled variable and any other relevant data. The CC shall correct any deficiencies discovered by the CA, if so directed by the ME.

4. The Testing and Balancing Contractor (TAB) shall be available on site to assist the CA verify proper operation of mechanical systems. The CA shall include in the specifications the number of sessions and hours per sessions on site required by the TAB. The TAB shall be expected to make new measurements or verify previous measurements, as requested by the CA, but shall not change air or hydronic flow rates unless so directed by the ME.

5. The Owner shall provide access as needed to all parts of the building as needed and as is practical, recognizing the need for sensitivity with regard to occupied portions of the building after occupancy.

METHOD OF CONSTRUCTION

The Town of East Montpelier will retain a Construction Manager to provide both preconstruction and construction management services including cost estimating, scheduling, bidding, and construction. The Town has retained Mark Blanchard mblanchard@viscc.com as the owner's representative.

PROPOSAL REQUIREMENTS

Proposals shall be submitted on the "Commissioning RFP Response Form" attached at the end of this RFP. Candidate firms may be asked to attend an interview with the Town subsequent to the due date of the RFP or to provide additional information about their proposal. Proposal shall include resume and relevant experience for personnel working on the project and their roles. Substitutions must be approved by the Owner. Provide hourly rates for each personnel for work that may exceed scope. Provide references including 3 most recent completed commissioning projects of similar size, both MEP and enclosure.

Email copies of your proposal which include the requirements as listed on the Commissioning RFP Response Form, to Town Administrator Jennifer Devine manager@eastmontpeliervt.org with copy to Mark Blanchard mblanchard@viscc.com.

Request for Voluntary Alternates: Firms are invited to include in their proposal any additions and/or changes to this scope of work (Voluntary Alternates) that will enhance the result and/or reduce the cost of commissioning services.

PROPOSAL SELECTION CRITERIA

The Town will use the following criteria to evaluate the qualifications of firms:

1. Completeness of the Proposal
2. Appropriateness of qualifications and experience of the firm and commissioning team
3. Favorable references of the firm and individuals proposed for the commissioning team
4. Fees for Commissioning Services, including hourly rates and reimbursable expenses

PROPOSAL DEADLINE
See cover sheet. Emailed bids are acceptable.

RFP Delivered To:
Jennifer Devine manager@eastmontpeliervt.org with copy to Mark Blanchard mblanchard@viscc.com.

The Town may elect to solicit additional information from certain firms. The Town reserves the right to reject any or all proposals.

QUESTIONS

Questions may be addressed via email to Jennifer Devine manager@eastmontpeliervt.org with copy to Mark Blanchard mblanchard@viscc.com

Provide the following:

Firm Name _____

Address and phone _____

_____

_____

Primary contact person for this project _____

Contact email _____

Provide the following budget table:

Pre-construction services _____

Construction services _____

Occupancy and Operation services _____

Total all phases _____

Hourly rates for further scope:

Role _____Personnel _____ Rate _____

Role _____Personnel _____ Rate _____

Role _____Personnel _____ Rate _____

Role _____Personnel _____ Rate _____

Role _____Personnel _____ Rate _____

Rates for Expenses _____

_____

_____

_____

END OF REQUEST FOR PROPOSAL

Engineering Services of Vermont, LLC
Mechanical-Electrical Consulting Engineers

9 Washington Street
Rutland, Vermont 05701
802 -855-8091

5430 Waterbury-Stowe Rd., 2nd Floor
Waterbury Center, VT 05677
802.882.8449

www.EngineeringVermont.com

East Montpelier Town Garage

East Montpelier, Vermont
Plumbing and Mechanical Basis of Design
FOR SCHEMATIC PRICING ONLY - NOT FOR CONSTRUCTION
May 23, 2024

DIVISION 22 PLUMBING SYSTEMS

1. Scope of Work:

    a. Provide new plumbing for:

        i. All plumbing fixtures included on the drawings,
        ii. Condensate drains piping for all heat pump units,
        iii. Garage trench drain system
        iv. Compressed Air System
        v. Emergency Shower Eyewash

    b. Connect to well system hyrdo-pneumatic tanks to serve domestic water system.

    c. Provide condensate drainage piping for all air conditioning equipment.

    d. Provide interior and exterior hose bibs and vacuum breakers.

    e. Plumbing to emergency eyewash shower

2. Domestic Water System:

    a. Domestic Water Distribution piping shall be Type "L" hard temper copper tubing, ASTM B-88. Fittings shall be wrought copper solder joint type. Use “Silverbrite” lead free solder with suitable flux for joining pipe and fittings. Pro-press shall be approved as an alternate. Copper pipe fitting shall be wrought copper solder joints, ANSI B-16.22, streamlined pattern joints and shall be made with "Silverbrite" lead free solder with non-corrosive flux. Piping ¾” and smaller may be PEX.

    b. Valves: shall be equal to Apollo, Milwaukee or Watts.

    c. Valves shall be provided to allow complete isolation of each toilet room from the main distribution system. All piping shall be provided with drain valves in the basement or west level to allow for complete drainage of each piping system.

d. Domestic Water Piping Specialties: Provide the following piping specialties for installation in piping systems at locations shown or as required by installation requirements.

i. Provide a Thermostatic mixing valve for domestic water heater.
ii. Provide Thermostatic mixing valve for emergency shower eyewash.

3. Sanitary Waste and Vent Systems:

a. Waste and Vent drainage piping shall be ASTM D-1785, and ASTM D-2665 schedule 40, PVC-DWV pipe. Fittings shall conform to ASTM D-2665 and shall be PVC-DWV fittings.

b. Provide schedule 40 PVC condensate drainage piping from all air conditioning condensate drains.

c. Drainage Specialties:

i. Line cleanouts: Zurn No. Z-1440, with raised hex head plug, DCCI.
ii. Wall cleanouts: Zurn No. Z-1447, bronze square access panel with vandal proof secured top, min. size 8" x 8" or as required for equipment. Provide raised hex plug behind cover.
iii. Cleanouts in waste piping 2" and under shall be screwed plugs to suit type of piping, i.e. copper, galvanized, etc.
iv. Floor cleanouts: Zurn Model Z-1400, "Level-trol" adjustable floor cleanout with polished bronze top.
v. Floor Drains: Zurn Z-415, bronze type "B" strainer, 6" diameter with dura-coated cast iron body. Provide one floor drain in each toilet room, floor drains to include Sure Seal trap seals.
vi. Trench Drains: Provide cast in place, field constructed in garage bays with removable grating.

4. Pipe Hangers

a. All piping shall be rigidly supported from the building structure by means of approved hangers and supports.

5. Pipe Sleeves and Fire Stopping

a. Furnish and set sleeves to accommodate pipes passing through foundations, walls, floors, furring and ceilings. Cooperate with other Contractors in setting all sleeves. Sleeves shall be full thickness of construction. Fill annular space between pipe and sleeve with U. L. approved fire retarding packing, rated for 1 hour minimum. For PVC pipe provide approved fire stop collars.

b. Sleeves through exterior walls below grade, through foundation walls, shall be watertight construction. Use "Link-seal", compression type neoprene link seals installed in sleeve or core drilled hole.

6. Insulation:

    a. All new copper hot and cold water; hot water recirculating located above slabs shall be insulated with preformed fiberglass equal to Owens Corning Fiberglass 25, ASJ/SSL-11 all service jacket with self-sealing laps and vapor barrier. Thickness to be as follows:

Cold Water: (Domestic)	
All sizes: (With Vapor Barrier)	1/2"
Hot Water: (Domestic)	
1 ½" and smaller:	1"
2" and larger:	2"
Recirculating Hot Water: (Domestic)	
All sizes:	1"
Condensate drainage piping:	
All sizes:	1/2"

7. Access Panels:

    a. Provide access panels in ceilings and in walls to permit access to concealed valves, etc. Panels for shall be of sufficient size to permit access to concealed equipment. Valve access panels shall be 12" by 12" minimum and shall be fire rated where required.

8. Plumbing Fixtures:

    a. General Requirements: Angle stops, straight stops, stops integral with the faucets, or concealed type of lock shield, wheel handle stops for supplies shall be furnished and installed with fixtures as specified below. Exposed traps and supply pipes for all fixtures and equipment shall be chrome plated and connected to the rough piping systems at the wall. Wall escutcheons shall be chromium plated or nickel plated brass with polished, bright surfaces. Fixtures shall be as specified or approved equal.

    P-1 Water closet: Flush Tank 1.28 GPF, manual operated flush tank elongated bowl, floor mounted. Provide elongated seat less cover.
    P-1A Accessible Water closet: Flush Tank 1.28 GPF, manual operated flush tank, elongated bowl, ADA compliant, bowl height, floor mounted. Provide elongated seat less cover. Mount per ADA requirements.
    P-2 Accessible Lavatory: Provide wall mounted sink with, mounted for ADA accessibility. Provide single lever faucet. Provide chrome plated wall supplies with wheel handled stop. Provide grid drain and chrome plated brass P-trap. Provide PVC insulation kit on all exposed piping. Mount per ADA requirements.
    P-3 Accessible Single Bowl Kitchen Sink: Provide accessible, 18 gauge type, double bowl kitchen sink drilled for listed faucet. Provide basket strainer, faucet to be 1.5 GPM single handle faucet with spray. Provide Truebro "Handi-Lav" insulation kit on all exposed piping. Mount per ADA requirements.

P-4 Accessible Shower: Shower to be roll in shower, one-piece, gel coat fiberglass shower with top corner shelves, chrome shower curtain, chrome recessed soap, white vinyl shower curtain with stainless steel hooks. Provide factory mounted ADA compliant Grab bar, fold-up phenolic seat and drain. Provide factory mounted slide bar for shower compatible with the specified shower. Provide shower valve assembly pressure balanced mixing valve with integral service stops, hand held head, Standard shower head, diverting valve, and slide bar mounting, clear-flo shower head and diverting valve. Contractor to grout base of tub/shower per manufacturer's instructions using multi-purpose thin set, to prevent deflection.
P-5 Garage Service Sink: Provide 24"x24" Stainless steel service sink with service faucet with vacuum breaker.

b. Provide three exterior non-freeze wall hyrdants.

c. Provide five interior non-freeze wall hyrdants.
   i. Two between garage doors
   ii. One near administration
   iii. One near Grader
   iv. One near grader, this location will also require hot water

DIVISION 23 MECHANICAL SYSTEMS

1. System Options: the following system options shall be priced.
   a. Option 1 Biomass Pellet Boiler System
      i. Provide two (2) MESYS model PE48 pellet boilers with a rated output of 164,000 BTUH each.
      ii. Provide 18.41 ton galvanized outdoor pellet silo.
      iii. Provide vacuum pellet silo pellet transfer lines to each boiler.
      iv. Garage Bay Heating
         1. Provide complete in-floor hot water radiant system for garage rated for 250 MBH
         2. Provide six (6) radiant headers, with over head hot water distribution form boiler room to each header
         3. Provide radiant tubing installed in slab and attached to 4" rigid insulation, 12" OC maximum spacing , ½" PEX tubing
      v. Garage Ventilation System
         1. Provide two 4300 CFM side wall exhaust fans
         2. Provide two intake louvers with motorized dampers and with intake duct dropped to within 12" of the floor.
         3. Provide NO2 and CO detection system activation of the detection system shall open the intake dampers and start the fans until the room levels drop to a safe level.
         4. Also provide space humidity sensors and manual spring wound timers for control of the fans and intake dampers.
         5. The ventilation system controls shall be arranged to cover 50% of the garage, so that each fan and intake can operate independently.

6. Provide Lincoln Prism Wall Mounted MERV 14 dual air wall pack filter unit for welding table.

vi. Office Area HVAC system
1. Provide a 100 CFM energy recovery ventilation system for the office area, the system shall exhaust 50 CFM from each bathroom and supply 25 CFM to the office and 75 CFM to the conference room. The system shall run on a time clock.
2. Provide a 0.5 ton, one to one, ductless heat pump system for the Office.
3. Provide a 0.5 ton, one to one, ductless heat pump system for the Conference Room.
4. Heat pump shall be first stage of heat, provide supplemental hot water heating system as follows:
    a. Provide a cabinet heater for the entry corridor
    b. Provide hot water baseboard in the Office and Conference Room
    c. Provide hot water wall heater in Toilet 102

vii. Domestic Water Heaters: Provide one (1) Indirect 80 gallon water heater served from the pellet boiler system for winter use. Provide two (2) 80 gallon heat pump water heaters for summer use.

b. <u>Option 2 Air to Water Heat Pump System</u>

i. Provide four (4) air to water heat pumps, Nortic model ATW-75 inverter units with a rated output of 25,100 BTUH each at -5F outdoor air temperature, 38,400 BTUH at 17 deg F outdoor air temperature. Each heat pump piped to a 70 gallon AltSource Back-up tank, with a 20KW supplemental electric heating element.

ii. Garage Bay Heating
1. Provide complete in-floor hot water radiant system for garage rated for 250 MBH
2. Provide six (6) radiant headers, with over head hot water distribution from buffer tanks to each header
3. Provide radiant tubing installed in slab and attached to 4" rigid insulation, 12" OC maximum spacing , ½" PEX tubing

iii. Garage Ventilation System
1. Provide two 4300 CFM side wall exhaust fans
2. Provide two intake louvers with motorized dampers and with intake duct dropped to within 12" of the floor.
3. Provide NO2 and CO detection system activation of the detection system shall open the intake dampers and start the fans until the room levels drop to a safe level.
4. Also provide space humidity sensors and manual spring wound timers for control of the fans and intake dampers.
5. The ventilation system controls shall be arranged to cover 50% of the garage, so that each fan and intake can operate independently.
6. Provide Lincoln Prism Wall Mounted MERV 14 dual air wall pack filter unit for welding table.

iv. Office Area HVAC system

1. Provide a 100 CFM energy recovery ventilation system for the office area, the system shall exhaust 50 CFM from each bathroom and supply 25 CFM to the office and 75 CFM to the conference room. The system shall run on a time clock.
2. Provide a 0.5 ton, one to one, ductless heat pump system for the Office.
3. Provide a 0.5 ton, one to one, ductless heat pump system for the Conference Room.
4. Heat pump shall be first stage of heat, provide supplemental electric heating system as follows:
    a. Provide a cabinet heater for the entry corridor
    b. Provide wall heater in toilet room
    c. Provide baseboard in the Office and Conference Room
5. Provide wall heater in Toilet 102

v. Domestic Water Heaters: Provide two (2) 80 gallon heat pump water heaters.

c. Option 3 Geothermal Heat Pump System

i. Provide four (4) nominal 5 ton geothermal heat pumps, Water Furnace 5 series model 500W11, with a rated output of 49,000 BTUH each using a closed loop geothermal glycol loop system. Pipe each geothermal heat pump two 80 gallon thermal buffer tanks. Provide a 15 KW supplemental electric boiler.

ii. Closed loop option:
1. Provide eight (8) 500 ft closed loop wells connected to the four geothermal heat pumps.
2. Geothermal loop to be filled with 30% propylene glycol.

iii. Open loop option:
1. Provide 60 GPM production wells and 60 GPM of return wells. Provide a stainless steel plate and frame heat exchanger to separate the heat pumps from the wells. The other side of the plate heat exchanger shall be connected to the four geothermal heat pumps.

iv. Garage Bay Heating
1. Provide complete in-floor hot water radiant system for garage rated for 250 MBH
2. Provide six (6) radiant headers, with over head hot water distribution from the two heat pumps to each header
3. Provide radiant tubing installed in slab and attached to 4" rigid insulation, 12" OC maximum spacing , ½" PEX tubing

v. Garage Ventilation System
1. Provide two 4300 CFM side wall exhaust fans
2. Provide two intake louvers with motorized dampers and with intake duct dropped to within 12" of the floor.
3. Provide NO2 and CO detection system activation of the detection system shall open the intake dampers and start the fans until the room levels drop to a safe level.
4. Also provide space humidity sensors and manual spring wound timers for control of the fans and intake dampers.

5. The ventilation system controls shall be arranged to cover 50% of the garage, so that each fan and intake can operate independently.
6. Provide Lincoln Prism Wall Mounted MERV 14 dual air wall pack filter unit for welding table.

vi. Office Area HVAC system

1. Provide a 100 CFM energy recovery ventilation system for the office area, the system shall exhaust 50 CFM from each bathroom and supply 25 CFM to the office and 75 CFM to the conference room. The system shall run on a time clock.
2. Provide a 0.5 ton, one to one, ductless heat pump system for the Office.
3. Provide a 0.5 ton, one to one, ductless heat pump system for the Conference Room.
4. Heat pump shall be first stage of heat, provide supplemental electric heating system as follows:
    a. Provide a cabinet heater for the entry corridor
    b. Provide wall heater in toilet room
    c. Provide baseboard in the Office and Conference Room
5. Provide wall heater in Toilet 102

vii. Domestic Water Heater: Provide one (1) Indirect 80 gallon water heater served from the geothermal system.

2. Heating Piping and Fittings

    a. Heating Piping and Tubing: Hydronic heating piping shall be type "L" hard copper tubing with wrought copper fittings for solder fitting assembly. Copper pipe fitting shall be wrought copper solder joints, ANSI B-16.22, streamlined pattern joints and shall be made with "Silverbrite" lead free solder with non-corrosive flux. "Pro-Press" shall also be permitted. Piping ¾" and smaller may be PEX.

    b. Interior Heating Piping and Tubing 2" and larger shall be schedule 10 black steel piping with Victaulic fittings.

    c. To prevent corrosion caused by dissimilar materials provide dielectric unions equal to Watts Series 3000, with materials to match piping system. Flanged dielectric fittings shall be equal to Watts Series 3100 with materials to match piping system.

3. Geothermal Well and Underground piping shall fusion welded DR11, rated for 200 PSIG, (PE) IPS/DIPS pipe shall be manufactured from a PE100/4710 high density copolymer resin meeting the requirements of ASTM D3350 and D3035. Pipe shall be manufactured to SDR 11 dimensions with a pressure rating of 200 psi respectively when measured at 68°F. The material shall achieve a minimum tensile strength of 3600 psi when tested at 73°F according to ASTM D 638. The material shall also comply with guidelines approved by the U.S. Food and Drug Administration (FDA) as specified in the Code of Federal Regulations (CFR), Title 21, Section 177.160 for basic polyethylene and Section 178.3297 "colorants for polymers" for pigments suitable for contact with foodstuff, pharmaceutical use and potable water. Piping materials shall conform to the requirements of ASTM D2837 for hydrostatic design basis. Industrial grade pipe shall be supplied capped off at the extruder and supplied in 20ft lengths. Detectable Underground Tape: Warning tape to be foil backed, 2" wide or greater with a continuous

message printed every 36" or less reading: "CAUTION GEOTHERMAL PIPELINE BURIED BELOW". Tape to be highly resistant to alkalis, acids and other destructive agents.

4. Valves

    a. Valves shall be equal to Apollo, Milwaukee or Watts. Valve type and numbers noted herein establish standard of type and quality. Valves shall have soldered joint ends for copper tube piping. Provide valves for services listed below and of the following types:

        i. Check Valve: Watts Series LFCVS, lead-free brass, 200 lb. W.O.G.

        ii. Ball Valves: Watts Series LFB6001, brass body, 600 lb. W.O.G., PTFE seat and seals and sweat ends. Provide handle extensions where pipe insulation thickness is 1" or greater.

        iii. Drain Valves: Watts Model No. LFB-6001, sweat ends with 3/4" hose connection with cap and chain.

        iv. Balancing Valves: All heat pumps shall be provided with self-balancing valves.

        v. Provide strainers in each heating circuit. Strainers shall be Wye Type, as manufactured by Armstrong or approved equal, designed for 125 psi, WSP minimum and shall be cast iron for 3" and larger, malleable iron or bronze with threaded ends for 2-1/2" and smaller. Mesh shall be stainless steel.

        vi. Strainers shall be provided with blow-down valve, with cap and chain.

5. Radiant tubing and accessories:

    a. Provide radiant tubing in lengths and locations as indicated, with capacities, sizes, spacings, and depths as indicated by drawings. Radiant tubing shall be a single layer, cross linked polyethylene extrusion with an outer layer composed of an EVOH oxygen barrier. Tubing shall be 1/2" I.D. Tubing shall conform to the Standard Thermoplastic Pipe Dimension Ration (SDR-9). Tubing shall contain a minimum cross-linking value of 65% and no greater than 89%, inclusive. Tubing shall meet ASTM standards F-876 and F-877. Tubing shall be warranted to 180 deg. F. in hydronic heating applications without detrimental effect. Tubing shall be hydrostatically designed for 315 PSI at 200 deg. F. and designed for operational pressure of 80 PSI at 200 deg. F. The tubing shall be designed for a burst pressure of 185 PSI at 200 deg. F.

    b. Provide 2" thick rigid insulation board below slab for installing radiant tubing. At the contractor's option provide thick Crete-Heat Insulated Floor Panel System for radiant tubing install. Panels shall be 2" thick rigid EPS foam with interlocking tongue and groove. Panel shall be rated R-10 minimum capable of holding 1/2" I.D. tubing. The knob shell shall be constructed of a durable high impact polymer.

    c. Stainless Steel Manifolds: Materials shall be stainless steel fitted with Watts Radiant base branches, ball valves, and tee branches. Manifolds shall be fitted with vent/purge assemblies for bleeding air or unions for acceptance of pressure test kits. Radiant PEX

shall be attached to the manifold branches by T-20 Compression fittings. Apply all tubing and fittings in accordance with manufacturer's specifications. Each return manifold connection shall be fitting with a visual flow and balance indicator capable of reading the specified flows.

d. Install tubing as indicated on drawings, schedules, and specifications, in accordance with the manufacturer's installation instructions. Locate tubing in the floors as indicated; cover areas continuously wall to wall at specified spacing unless otherwise indicated. Provide 2" rigid insulation as indicated by architect/engineer drawings. Provide pressure testing of 100 psi for a minimum of twenty-four (24) hours prior to, and during the pour for concrete applications; and for twenty-four (24) hours after installation of concrete.

e. Furnish and install Taco radiant mixing block model RMB for support area radiant zone. The unit shall include a variable speed injection circulator, constant speed system circulator, air elimination and solid state electronic controls permitting outdoor reset control, demand signal, delta T set point, temperature limit, warm weather shutdown. The controller shall include a LCD display and outdoor air senor and boiler water and radiant system strap-on sensors. The unit shall include a cord and plug connection with plug-in low voltage control connections.

6. Thermometers and Gauges

a. General: Provide pressure gauges on the inlet and discharge lines for each pump.

b. Provide thermometers for heat pump supply and return line for each circuit leaving the mechanical room, including the geothermal supply and return lines.

c. Thermometers shall be H.O. Trerice Catalog No. A40507 or approved equal, with 9" scale, adjustable angle, and separable socket.

d. Thermometers shall be installed so as to be easily read while standing on the floor.

e. Furnish and install pressure gauges for each pump system. Gauges shall be Trerice No. 450B with 4-1/2" dial, range as shown or approved equal to U.S. Gage or Crosby-Ashton. Each gauge shall be provided with a gauge cock. Gauges shall be installed so as to be easily read while standing on the floor. Provide pulsation dampener.

7. Pipe Insulation

a. All copper and steel heating piping shall be insulated with Manville FLAMESAFE fiberglass pipe insulation, Owens-Corning fiberglass 25, or approved equal as specified below. The insulation shall have an average thermal conductivity not to exceed .25 BTU in. per sq. ft. per F. per hour at a mean temperature of 75 degrees F. Thickness of the insulation shall be as scheduled below. Jacket shall be ASJ. The insulations shall be applied over clean dry pipe with all joints firmly together. Longitudinal jacket laps and the butt strips shall be smoothly secured with self-sealing longitudinal lap joints.

b. Minimum insulation thickness shall be as follows:

i. Heating 1 ½" and smaller: 1"
ii. Heating 1 ½" and larger: 2"

c. All new refrigeration, geothermal piping and condensate drainage piping including all pump bodies, valves, and piping accessories shall be insulated with Armacell "FS Armaflex" closed cell elastomeric foam or approved equal as specified below. The insulation shall have an average thermal conductivity not to exceed .25 BTU in. per sq. ft. per F. per hour at a mean temperature of 75 degrees F. Thickness of the insulation shall be as scheduled below. The insulations shall be applied over clean dry pipe with all joints firmly together. Provide un-slit tubular form with no longitudinal joint. Butt strips shall be smoothly secured with sealed with factory adhesive.

i. Geothermal Piping: 1 1/2"
ii. Condensate Piping 1/2"
iii. Refrigeration Piping 1/2"

8. Hydronic Specialties

a. Provide hydronic heating specialties for installation in piping system:

i. Expansion Tank: Taco model CA, fabricated steel shell, ASME rated and labeled per Section VII, Div. 1 for 125 psig, replaceable bladder.

ii. Air Separator: Spiro Vent size 3". Provide high capacity vent.

iii. Manual air vents shall be coin style vents with manual shut-off.

9. Circulator Pumps

a. Circulator pumps be ECM type equal to Grundfos, or Wilo automatic capacity adjustment with on-board control electronics for variable speed pumping.

10. Air Distribution Ductwork:

a. Duct construction shall be in accordance with best practices and latest SMACNA requirements for metal gauges, joints, reinforcing, and supports except where specified otherwise in these specifications. All exposed ductwork shall be constructed and hung to provide a neat, smooth, finished appearance. Cadmium plated sheet metal screws shall be used on all exposed ductwork. Ducts shall be free from thumping or rattling when fans are turned on or off. All ductwork shall be air sealed.

b. Ductwork system serving the circuit areas shall be corrosion resistant either epoxy coated galvanized steel, aluminum or stainless steel.

11. Ductwork Insulation

a. All intake ductwork and Heat Recovery supply ductwork shall be insulated with 1 1/2" thick one pound density duct wrap with factory applied reinforced aluminum jacket, insulation shall be equal to Knauf Duct Wrap with FSK facing. Product shall not exceed 25 flame spread, and 50 smoke development. Apply with 3" wide pressure sensitive

tape and sealing tool, for ducts over 18" wide secure insulation to duct with mechanical fasteners spaced on 18" centers. Limit average compression to 25% or less.

12. Controls:

a. Provide a new standalone control system to control the following:

Option 1 Pellet Boiler HVAC System Controls

i. Pellet Boiler and Hydronic Heating System: When pellet boilers are energized boilers PB-1 and PB-2 shall stage on and off as needed to maintain loop set point temperature.

ii. Pumps shall be controlled using factory controller on the boiler to ensure safe operation of the pellet boiler.

iii. Control system shall monitor temperature in the primary heating loop. When loop temperature drops below set point, is above 140 deg. F, pellet boilers shall be energized to inject into the main heating loop to maintain set point.

iv. The boilers shall be controlled using a factory cascade controller shall provide staging control of the pellet boilers. The system hot water shall be reset as follows:

0 degrees F	170 degrees HWS Temperature
60 degrees F	100 degrees HWS Temperature

v. Primary heat for the Office shall be the air source heat pump, when supplemental heat is required in the Office Area, the heating pump for the Office area shall start and run.

vi. The controls shall start radiant heating pump whenever there is a call for heating in the garage heating zone. The controller shall provide a variable speed signal to the injection pump to maintain the target hot water supply temperature. Provide a programmable thermostat for control of the garage heating zone. Provide indoor sensor, outdoor sensor, wiring and controls for a fully functioning system.

vii. Boiler Room Ventilation Air: Provide a space cooling thermostat to open boiler room ventilation damper if the room temperature exceeds 80 Deg. F.

viii. Domestic Water Heater Pump: The domestic water pump shall be controlled by an immersion aquastat on the water heater. During the summer months the boilers shall remain off. The domestic water heater shall be set-up for priority control of the boilers during the heating season, a priority heat call from the water heater shall shutdown the heating pumps until the water heater is satisfied, once satisfied the heating pumps shall be reactivated under normal control.

i. Office area shall include programmable thermostats for control of heating and cooling in this area.

ii. Garage Ventilation: Exhaust fans shall be controlled by a 24 volt wall timer switch, a 24 volt space humidistat, carbon monoxide detector, and nitrogen dioxide detector. Activation of any of these controls shall be capable of starting the fans. Upon activation of any of these controls the outdoor air damper shall open and the end switch on the damper shall start the exhaust fan. Each fan and damper system shall include independent controls for approximately 50% of the Garage.

iii. Alarm shall be activated if elevated levels of CO or NO2 are present after the ventilation system is activated. If the carbon monoxide (CO) level reaches 25 ppm in a 5 minute period or if the nitrogen dioxide level exceeds 5 ppm in a 5 minute period then a remote alarm light and the audible alarm shall be activated.

Option 2 Air to Water Heat Pump HVAC System Controls

i. Air to water Heat Pump units connected to indoor supplemental heat tanks, Heating System: When the outdoor air temperature is less than 65 Deg F the heat pumps shall be energized, supplemental elements shall only be energized to maintain tanks at design temperature when the heat pump cannot maintain tank temperature.

ii. The heat pumps shall be controlled using a factory controller.

iii. The controls shall start radiant heating pump whenever there is a call for heating in the garage heating zone. The controller shall provide a variable speed signal to the injection pump to maintain the target hot water supply temperature. Provide a programmable thermostat for control of the garage heating zone. Provide indoor sensor, outdoor sensor, wiring and controls for a fully functioning system.

iv. Garage Ventilation: Exhaust fans shall be controlled by a 24 volt wall timer switch, a 24 volt space humidistat, carbon monoxide detector, and nitrogen dioxide detector. Activation of any of these controls shall be capable of starting the fans. Upon activation of any of these controls the outdoor air dampers shall open and the end switches on the damper shall start the exhaust fans. If the carbon monoxide (CO) level reaches 25 ppm in a 5 minute period then an alarm shall sound, alarm light activated and the fan and dampers shall be energized. The nitrogen dioxide (NO2) detection system shall energize the fan and dampers if a 0.20 ppm concentration of nitrogen dioxide is present. If the nitrogen dioxide level exceeds 5 ppm a remote alarm light and the audible alarm shall be activated. The dampers shall open and the fan shall also start upon activation of manual timer switch or when space humidity level rises above the humidistat setpoint.

v. The office area shall be provided with programmable thermostats to control zone heat pumps and supplemental electric heat to maintain zone temperatures.

vi. Provide standalone programmable thermostats for electric supplemental heaters in rooms without heat pumps.

Option 3 Geothermal HVAC System Controls

i. Heat pumps and closed loop circulator pumps serving the buffer tanks shall be energized (typical for four heat pumps and respective pumps). When there is a call for hot water in either the water heater or radiant heating the heat pump system shall be energized.

ii. The controls shall start radiant heating pump whenever there is a call for heating in the garage heating zone. The controller shall provide a variable speed signal to the injection pump to maintain the target hot water supply temperature. Provide a programmable thermostat for control of the garage heating zone. Provide indoor sensor, outdoor sensor, wiring and controls for a fully functioning system.

iii. Provide a supplemental 15 kw electric boiler to maintain buffer tanks at target temperatures.

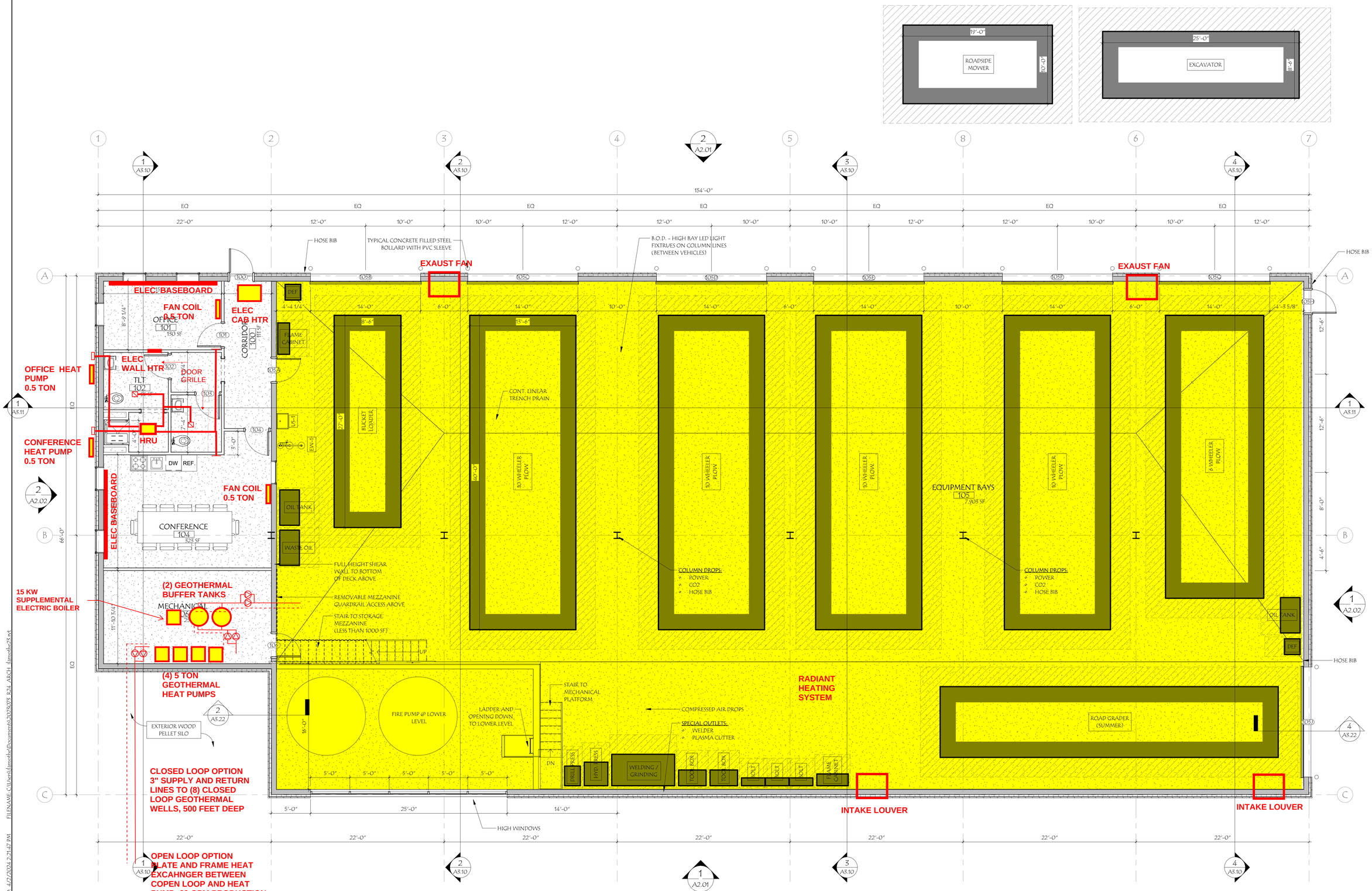
vii. Garage Ventilation: Exhaust fans shall be controlled by a 24 volt wall timer switch, a 24 volt space humidistat, carbon monoxide detector, and nitrogen dioxide detector. Activation of any of these controls shall be capable of starting the fans. Upon activation of any of these controls the outdoor air dampers shall open and the end switches on the damper shall start the exhaust fans. If the carbon monoxide (CO) level reaches 25 ppm in a 5 minute period then an alarm shall sound, alarm light activated and the fan and dampers shall be energized. The nitrogen dioxide (NO2) detection system shall energize the fan and dampers if a 0.20 ppm concentration of nitrogen dioxide is present. If the nitrogen dioxide level exceeds 5 ppm a remote alarm light and the audible alarm shall be activated. The dampers shall open and the fan shall also start upon activation of manual timer switch or when space humidity level rises above the humidistat setpoint.

viii. The office area shall be provided with programmable thermostats to control zone heat pumps and supplemental heat to maintain zone temperatures.

ix. Provide standalone programmable thermostats for electric supplemental heaters in rooms without heat pumps.

13. Energy Monitoring:

a. Provide an EGauge electrical energy monitoring system for electricity consumption of all subsystems or groups of subsystems, coordinate requirements with Electrical.



SCHEMATIC DESIGN
NOT FOR CONSTRUCTION

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EAST MONTPELIER TOWN GARAGE

EAST MONTPELIER VERMONT

#	DATE	REVISION DESCRIPTION

PROGRESS PRINT DATE: 4/2/2024 2:21:47 PM
PLAN NORTH
SCALE: 3/16" = 1'-0"
PROJECT NO: 2023073
DRAWN BY: JPL
CHECKED BY: DPR

SHEET TITLE: FLOOR PLAN

SHEET NUMBER:

OPTION 3
GEOTHERMAL HEAT PUMP SYSTEM

PRINTED: 4/2/2024 2:21:47 PM FILENAME: C:\Users\JamesHeD\Documents\2023073_R24_ARCH_JamesHe25.rvt

WLA

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wla-vt.com

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#	DATE	REVISION DESCRIPTION

TOWN GARAGE

EAST MONTPELIER, VERMONT

N

PROPOSED RENDERED VIEWS

PROJECT NO:	2023073
DATE:	JULY 1, 2024
CHECKED BY:	DPR
DRAWN BY:	JFL
SCALE:	

SD-02

PRINTED: 6/26/2024 2:03:23 PM FILENAME: C:\Users\jlamothe\Documents\2023073_R24_ARCH_jlamothe23.rvt

Town Garage Project Schedule - Draft	2023	24-Jan-May	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25
Pre-Design/ Schematic Design																					
Pre-Construction																					
20. Assessments and studies needed?- H&H water, species studies, marsh studies, etc. environmental assessment and hazardous materials surveys, or other special studies. Geotechnical Investigation and Report needed?																					
21. Schedule/ budget revision																					
22. Apply for an obtain Necessary Permits/ Regulatory requirements: Fire Safety by April 18th Stormwater, Water / WW permit													April 18th								
23. Wiemann Lamphere A/E Services: DD complete January 10th; CD complete March 14th										DD - Jan 10th		CD - Mar 14th									
24. CM RFP Written																					
25. Put out to bid																					
Construction																					
Schedule (with SB approval)																					
Post Construction																					
28. Project evaluation, close out records to assure completeness, assist contractor with setting up warranties and submit final permit paperwork																					end date?

* This is a draft plan that needs feedback from all & approval still

Communication Plan:
Friday Mornings 8:30am - Meeting Request Sent by David Roy outlook invite with zoom meeting link
Emails
SB Meetings as needed

key:
green=completed task
grey= estimated timing

PROJECT TEAM:

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