

COMcheck Software Version 3.9.1

Mechanical Compliance Certificate

2009 IECC

Section 1: Project Information

Project Type: **New Construction**

Project Title : The Bay House

Construction Site:

Hancock Street
Portland, ME 04112

Owner/Agent:

Designer/Contractor:

Section 2: General Information

Building Location (for weather data):

Portland, Maine

Climate Zone:

6a

Section 3: Mechanical Systems List

Quantity System Type & Description

- | | |
|----|---|
| 94 | HVAC System 1 (Single Zone) :
Heating: 1 each - Central Furnace, Gas, Capacity = 51 kBtu/h, Efficiency = 80.00% Et
Cooling: 1 each - Packaged Terminal Unit, Capacity = 18 kBtu/h, Efficiency = 11.01 EER, Air-Cooled Condenser |
| 94 | Water Heater 1: Gas Instantaneous Water Heater, Capacity: 0 gallons, Input Rating: 120 Btu/h, Efficiency: 0.91 EF |

Section 4: Requirements Checklist

Requirements Specific To: HVAC System 1 :

- 1. Equipment minimum efficiency: Central Furnace (Gas): 80.00 % Et (or 78% AFUE)
- 2. Equipment minimum efficiency: Packaged Terminal DX Unit: 9.30 EER

Requirements Specific To: Water Heater 1 :

- 1. Water heating equipment meets minimum efficiency requirements: Gas Instantaneous Water Heater efficiency: 0.67 EF
- 2. First 8 ft of outlet piping is insulated

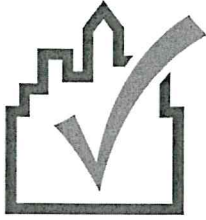
Generic Requirements: Must be met by all systems to which the requirement is applicable:

- 1. Plant equipment and system capacity no greater than needed to meet loads
Exception(s):
 - Standby equipment automatically off when primary system is operating
 - Multiple units controlled to sequence operation as a function of load
- 2. Minimum one temperature control device per system
- 3. Minimum one humidity control device per installed humidification/dehumidification system
- 4. Load calculations per ASHRAE/ACCA Standard 183.
- 5. Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup
Exception(s):
 - Continuously operating zones
 - 2 kW demand or less, submit calculations
- 6. Outside-air source for ventilation; system capable of reducing OSA to required minimum
- 7. R-5 supply and return air duct insulation in unconditioned spaces
R-8 supply and return air duct insulation outside the building
R-8 insulation between ducts and the building exterior when ducts are part of a building assembly
Exception(s):

- Ducts located within equipment
- Ducts with interior and exterior temperature difference not exceeding 15°F.
- 8. Mechanical fasteners and sealants used to connect ducts and air distribution equipment
- 9. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts; UL 181A or 181B tapes and mastics
Exception(s):
 - Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. pressure classification
- 10. Hot water pipe insulation: 1.5 in. for pipes ≤1.5 in. and 2 in. for pipes >1.5 in.
Chilled water/refrigerant/brine pipe insulation: 1.5 in. for pipes ≤1.5 in. and 1.5 in. for pipes >1.5 in.
Steam pipe insulation: 1.5 in. for pipes ≤1.5 in. and 3 in. for pipes >1.5 in.
Exception(s):
 - Piping within HVAC equipment.
 - Fluid temperatures between 55 and 105°F.
 - Fluid not heated or cooled with renewable energy.
 - Piping within room fan-coil (with AHRI440 rating) and unit ventilators (with AHRI840 rating).
 - Runouts <4 ft in length.
- 11. Operation and maintenance manual provided to building owner
- 12. Thermostatic controls have 5°F deadband
Exception(s):
 - Thermostats requiring manual changeover between heating and cooling
 - Special occupancy or special applications where wide temperature ranges are not acceptable and are approved by the authority having jurisdiction.
- 13. Balancing devices provided in accordance with IMC (2006) 603.17
- 14. Demand control ventilation (DCV) present for high design occupancy areas (>40 person/1000 ft² in spaces >500 ft²) and served by systems with any one of 1) an air-side economizer, 2) automatic modulating control of the outdoor air damper, or 3) a design outdoor airflow greater than 3000 cfm.
Exception(s):
 - Systems with heat recovery.
 - Multiple-zone systems without DDC of individual zones communicating with a central control panel.
 - Systems with a design outdoor airflow less than 1200 cfm.
 - Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1200 cfm.
- 15. Total cooling capacity without economizers must be less than 480 kBtu/h. This project lists 1692 kBtu/h capacity without economizers.
- 16. Motorized, automatic shutoff dampers required on exhaust and outdoor air supply openings
Exception(s):
 - Gravity dampers acceptable in buildings <3 stories
 - Gravity dampers acceptable in systems with outside or exhaust air flow rates less than 300 cfm where dampers are interlocked with fan
- 17. Automatic controls for freeze protection systems present
- 18. Exhaust air heat recovery included for systems 5,000 cfm or greater with more than 70% outside air fraction or specifically exempted
Exception(s):
 - Hazardous exhaust systems, commercial kitchen and clothes dryer exhaust systems that the International Mechanical Code prohibits the use of energy recovery systems.
 - Systems serving spaces that are heated and not cooled to less than 60°F.
 - Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
 - Heating systems in climates with less than 3600 HDD.
 - Cooling systems in climates with a 1 percent cooling design wet-bulb temperature less than 64°F.
 - Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
 - Laboratory fume hood exhaust systems that have either a variable air volume system capable of reducing exhaust and makeup air volume to 50 percent or less of design values or, a separate make up air supply meeting the following makeup air requirements:
 - a) at least 75 percent of exhaust flow rate, b) heated to no more than 2°F below room setpoint temperature, c) cooled to no lower than 3°F above room setpoint temperature, d) no humidification added, e) no simultaneous heating and cooling.

Section 5: Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2009 IECC requirements in COMcheck Version 3.9.1 and to comply with the mandatory requirements in the Requirements Checklist.



COMcheck Software Version 3.9.1

Mechanical Requirements Description

2009 IECC

The following list provides more detailed descriptions of the requirements in Section 4 of the Mechanical Compliance Certificate.

Requirements Specific To: HVAC System 1 :

1. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency:
Central Furnace (Gas): 80.00 % Et (or 78% AFUE)
2. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency:
Packaged Terminal DX Unit: 9.30 EER

Requirements Specific To: Water Heater 1 :

1. Water heating equipment used solely for heating potable water, pool heaters, and hot water storage tanks must meet the following minimum efficiency: Gas Instantaneous Water Heater efficiency: 0.67 EF
2. Insulation must be provided for the first 8 ft of outlet piping for a constant temperature nonrecirculating storage system and for the inlet pipe between the storage tank and a heat trap in a storage system.

Generic Requirements: Must be met by all systems to which the requirement is applicable:

1. All equipment and systems must be sized to be no greater than needed to meet calculated loads. A single piece of equipment providing both heating and cooling must satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

Exception(s):

- The equipment and/or system capacity may be greater than calculated loads for standby purposes. Standby equipment must be automatically controlled to be off when the primary equipment and/or system is operating.
 - Multiple units of the same equipment type whose combined capacities exceed the calculated load are allowed if they are provided with controls to sequence operation of the units as the load increases or decreases.
2. Each heating or cooling system serving a single zone must have its own temperature control device.
 3. Each humidification system must have its own humidity control device.
 4. Design heating and cooling loads for the building must be determined using procedures in the ASHRAE Handbook of Fundamentals or an approved equivalent calculation procedure.
 5. The system or zone control must be a programmable thermostat or other automatic control meeting the following criteria:
 - a) capable of setting back temperature to 55°F during heating and setting up to 85°F during cooling,
 - b) capable of automatically setting back or shutting down systems during unoccupied hours using 7 different day schedules,
 - c) have an accessible 2-hour occupant override,
 - d) have a battery back-up capable of maintaining programmed settings for at least 10 hours without power.

Exception(s):

- A setback or shutoff control is not required on thermostats that control systems serving areas that operate continuously.
 - A setback or shutoff control is not required on systems with total energy demand of 2 kW (6,826 Btu/h) or less.
6. The system must supply outside ventilation air as required by Chapter 4 of the International Mechanical Code. If the ventilation system is designed to supply outdoor-air quantities exceeding minimum required levels, the system must be capable of reducing outdoor-air flow to the minimum required levels.
 7. Air ducts must be insulated to the following levels:
 - a) Supply and return air ducts for conditioned air located in unconditioned spaces (spaces neither heated nor cooled) must be insulated with a minimum of R-5. Unconditioned spaces include attics, crawl spaces, unheated basements, and unheated garages.
 - b) Supply and return air ducts and plenums must be insulated to a minimum of R-8 when located outside the building.
 - c) When ducts are located within exterior components (e.g., floors or roofs), minimum R-8 insulation is required only between the duct and the building exterior.

Exception(s):

- Duct insulation is not required on ducts located within equipment.
 - Duct insulation is not required when the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15°F.
8. Mechanical fasteners and seals, mastics, or gaskets must be used when connecting ducts to fans and other air distribution equipment, including multiple-zone terminal units.
 9. All joints, longitudinal and transverse seams, and connections in ductwork must be securely sealed using weldments; mechanical fasteners with seals, gaskets, or mastics; mesh and mastic sealing systems; or tapes. Tapes and mastics must be listed and labeled in accordance with UL 181A and shall be marked '181A-P' for pressure sensitive tape, '181A-M' for mastic or '181A-H' for heat-sensitive

tape. Tapes and mastics used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked '181B-FX' for pressure-sensitive tape or '181B-M' for mastic. Unlisted duct tape is not permitted as a sealant on any metal ducts.

Exception(s):

- Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. pressure classification.
10. All pipes serving space-conditioning systems must be insulated as follows:
- Hot water piping for heating systems:
 - 1 1/2 in. for pipes \leq 1 1/2-in. nominal diameter,
 - 2 in. for pipes $>$ 1 1/2-in. nominal diameter.
 - Chilled water, refrigerant, and brine piping systems:
 - 1 1/2 in. insulation for pipes \leq 1 1/2-in. nominal diameter,
 - 1 1/2 in. insulation for pipes $>$ 1 1/2-in. nominal diameter.
 - Steam piping:
 - 1 1/2 in. insulation for pipes \leq 1 1/2-in. nominal diameter,
 - 3 in. insulation for pipes $>$ 1 1/2-in. nominal diameter.
- Exception(s):
- Pipe insulation is not required for factory-installed piping within HVAC equipment.
 - Pipe insulation is not required for piping that conveys fluids having a design operating temperature range between 55°F and 105°F.
 - Pipe insulation is not required for piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
 - Piping within room fan-coil (with AHRI440 rating) and unit ventilators (with AHRI840 rating).
 - Pipe insulation is not required for runout piping not exceeding 4 ft in length and 1 in. in diameter between the control valve and HVAC coil.
11. Operation and maintenance documentation must be provided to the owner that includes at least the following information:
- a) equipment capacity (input and output) and required maintenance actions
 - b) equipment operation and maintenance manuals
 - c) HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions; desired or field-determined set points must be permanently recorded on control drawings, at control devices, or, for digital control systems, in programming comments
 - d) complete narrative of how each system is intended to operate.
12. Thermostats controlling both heating and cooling must be capable of maintaining a 5°F deadband (a range of temperature where no heating or cooling is provided).
- Exception(s):
- Deadband capability is not required if the thermostat does not have automatic changeover capability between heating and cooling.
 - Special occupancy or special applications where wide temperature ranges are not acceptable and are approved by the authority having jurisdiction.
13. Balancing devices provided in accordance with IMC (2006) 603.17.
14. Demand control ventilation (DCV) required for high design occupancy areas ($>$ 40 person/1000 ft² in spaces $>$ 500 ft²) and served by systems with any one of 1) an air-side economizer, 2) automatic modulating control of the outdoor air damper, or 3) a design outdoor airflow greater than 3000 cfm.
- Exception(s):
- Systems with heat recovery.
 - Multiple-zone systems without DDC of individual zones communicating with a central control panel.
 - Systems with a design outdoor airflow less than 1200 cfm.
 - Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1200 cfm.
15. Total capacity of all cooling systems without economizers shall not exceed 480 kBtu/h per building, or 20 percent of its air economizer capacity, whichever is greater. For this project the total capacity of all cooling equipment without economizers must be less than 480 kBtu/h. This project lists 1692 kBtu/h capacity without economizers.
16. Outdoor air supply and exhaust systems must have motorized dampers that automatically shut when the systems or spaces served are not in use. Dampers must be capable of automatically shutting off during preoccupancy building warm-up, cool-down, and setback, except when ventilation reduces energy costs (e.g., night purge) or when ventilation must be supplied to meet code requirements. Both outdoor air supply and exhaust air dampers must have a maximum leakage rate of 3 cfm/ft² at 1.0 in w.g. when tested in accordance with AMCA Standard 500.
- Exception(s):
- Gravity (non-motorized) dampers are acceptable in buildings less than three stories in height.
 - Systems with a design outside air intake or exhaust capacity of 300 cfm (140 L/s) or less that are equipped with motor operated dampers that open and close when the unit is energized and de-energized, respectively.
17. All freeze protection systems, including self-regulating heat tracing, must include automatic controls capable of shutting off the systems when outside air temperatures are above 40°F or when the conditions of the protected fluid will prevent freezing. Snow- and ice-melting systems must include automatic controls capable of shutting off the systems when the pavement temperature is above

50°F and no precipitation is falling, and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.

18. Individual fan systems with a design supply air capacity of 5000 cfm or greater and minimum outside air supply of 70 percent or greater of the supply air capacity must have an energy recovery system with at least a 50 percent effectiveness. Where cooling with outdoor air is required there is a means to bypass or control the energy recovery system to permit cooling with outdoor air.

Exception(s):

- Hazardous exhaust systems, commercial kitchen and clothes dryer exhaust systems that the International Mechanical Code prohibits the use of energy recovery systems.
- Systems serving spaces that are heated and not cooled to less than 60°F.
- Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
- Heating systems in climates with less than 3600 HDD.
- Cooling systems in climates with a 1 percent cooling design wet-bulb temperature less than 64°F.
- Systems requiring dehumidification that employ energy recovery in series with the cooling coil..
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