



# Envelope Compliance Certificate

## Section 1: Project Information

Energy Code: **2009 IECC**  
Project Title: Marriot AC Hotel  
Project Type: New Construction

Construction Site:  
York & High Street  
Portland, ME

Owner/Agent:  
Opechee Construction Corporation  
11 Corporate Drive  
Belmont, NH

Designer/Contractor:  
Kurt Magnusson, P.E.  
Mechanical Systems Engineers  
10 Forest Falls Drive - Suite 10B  
Yarmouth, ME

Building Location (for weather data): Portland, Maine  
Climate Zone: 6a  
Vertical Glazing / Wall Area Pct.: 32%

**Building Use: Activity Type(s)** **Floor Area**  
1-Marriot AC (Hotel) : Nonresidential 93191

## Section 2: Envelope Assemblies and Requirements Checklist

**Envelope PASSES: Design 8% better than code.**

### Envelope Assemblies:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor <sup>(a)</sup>
Roof 1: Insulation Entirely Above Deck, [Bldg. Use 1 - Marriot AC]	16823	---	26.0	0.037	0.048
Exterior Wall 1: Steel-Framed, 16" o.c., [Bldg. Use 1 - Marriot AC]	44065	21.0	2.8	0.082	0.064
Window 1: Metal Frame with Thermal Break, Perf. Specs.: Product ID Guardian SunGuard SN 68, SHGC 0.37, [Bldg. Use 1 - Marriot AC] (b)	14062	---	---	0.250	0.550
Door 1: Insulated Metal, Swinging, [Bldg. Use 1 - Marriot AC]	630	---	---	0.200	0.700
Door 2: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID Guardia SunGuard SN 68, SHGC 0.37, [Bldg. Use 1 - Marriot AC] (b)	139	---	---	0.250	0.800
Floor 1: Slab-On-Grade:Unheated, Horizontal with vertical 4 ft., [Bldg. Use 1 - Marriot AC]	550	---	7.2	---	---

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.  
(b) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.

### Air Leakage, Component Certification, and Vapor Retarder Requirements:

- 1. All joints and penetrations are caulked, gasketed or covered with a moisture vapor-permeable wrapping material installed in accordance with the manufacturer's installation instructions.
- 2. Windows, doors, and skylights certified as meeting leakage requirements.
- 3. Component R-values & U-factors labeled as certified.
- 4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
- 5. 'Other' components have supporting documentation for proposed U-Factors.
- 6. Insulation installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.
- 7. Stair, elevator shaft vents, and other outdoor air intake and exhaust openings in the building envelope are equipped with motorized dampers.
- 8. Cargo doors and loading dock doors are weather sealed.
- 9. Recessed lighting fixtures installed in the building envelope are Type IC rated as meeting ASTM E283, are sealed with gasket or caulk.

10. Building entrance doors have a vestibule equipped with self-closing devices.

Exceptions:

- Building entrances with revolving doors.
- Doors not intended to be used as a building entrance.
- Doors that open directly from a space less than 3000 sq. ft. in area.
- Doors used primarily to facilitate vehicular movement or materials handling and adjacent personnel doors.
- Doors opening directly from a sleeping/dwelling unit.

### Section 3: Compliance Statement

*Compliance Statement:* The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2009 IECC requirements in COMcheck Version 4.0.3.1 and to comply with the mandatory requirements in the Requirements Checklist.

KURT MAGNUSSON P.E.  
Name - Title MECHANICAL ENGINEER

Signature 

Date 12/27/16



# Mechanical Compliance Certificate

## Section 1: Project Information

Energy Code: **2009 IECC**  
Project Title: Marriot AC Hotel  
Project Type: New Construction

Construction Site:  
York & High Street  
Portland, ME

Owner/Agent:  
Opechee Construction Corporation  
11 Corporate Drive  
Belmont, NH

Designer/Contractor:  
Kurt Magnusson, P.E.  
Mechanical Systems Engineers  
10 Forest Falls Drive - Suite 10B  
Yarmouth, ME

## Section 2: General Information

Building Location (for weather data): Portland, Maine  
Climate Zone: 6a

## Section 3: Mechanical Systems List

### Quantity System Type & Description

- 8 HVAC System 1 (Multiple-Zone) : Water Source Heat Pump  
Heating Mode: Capacity = 10 kBtu/h,  
Proposed Efficiency = 4.90 COP, Required Efficiency = 4.20 COP  
Cooling Mode: Capacity = 7 kBtu/h,  
Proposed Efficiency = 13.00 EER, Required Efficiency = 11.20 EER  
Fan System: 1/2 ton heat pump -- Compliance (Motor nameplate HP method) : Passes  
  
Fans:  
FAN 1 Supply, Constant Volume, 230 CFM, 0.1 motor nameplate hp
- 136 HVAC System 2 (Single Zone) : Water Source Heat Pump  
Heating Mode: Capacity = 11 kBtu/h,  
Proposed Efficiency = 4.90 COP, Required Efficiency = 4.20 COP  
Cooling Mode: Capacity = 8 kBtu/h,  
Proposed Efficiency = 13.00 EER, Required Efficiency = 11.20 EER  
Fan System: 3/4 ton heat pump -- Compliance (Motor nameplate HP method) : Passes  
  
Fans:  
FAN 2 Supply, Constant Volume, 230 CFM, 0.1 motor nameplate hp
- 49 HVAC System 3 (Single Zone) : Water Source Heat Pump  
Heating Mode: Capacity = 14 kBtu/h,  
Proposed Efficiency = 4.90 COP, Required Efficiency = 4.20 COP  
Cooling Mode: Capacity = 11 kBtu/h,  
Proposed Efficiency = 14.00 EER, Required Efficiency = 11.20 EER  
Fan System: 1 ton heat pump -- Compliance (Motor nameplate HP method) : Passes  
  
Fans:  
FAN 7 Supply, Constant Volume, 420 CFM, 0.1 motor nameplate hp
- 17 HVAC System 4 (Single Zone) : Water Source Heat Pump  
Heating Mode: Capacity = 18 kBtu/h,  
Proposed Efficiency = 4.50 COP, Required Efficiency = 4.20 COP  
Cooling Mode: Capacity = 14 kBtu/h,  
Proposed Efficiency = 13.50 EER, Required Efficiency = 11.20 EER  
Fan System: 1.25 ton heat pump -- Compliance (Motor nameplate HP method) : Passes  
  
Fans:  
FAN 8 Supply, Constant Volume, 420 CFM, 0.1 motor nameplate hp

- 4 HVAC System 5 (Single Zone) : Water Source Heat Pump  
 Heating Mode: Capacity = 35 kBtu/h,  
 Proposed Efficiency = 4.80 COP, Required Efficiency = 4.20 COP  
 Cooling Mode: Capacity = 28 kBtu/h,  
 Proposed Efficiency = 13.30 EER, Required Efficiency = 12.00 EER  
 Fan System: 2.5 ton heat pump -- Compliance (Motor nameplate HP method) : Passes
- Fans:  
 FAN 10 Supply, Constant Volume, 870 CFM, 0.3 motor nameplate hp
- 3 HVAC System 6 (Single Zone) :  
 Heating: 1 each - Duct Furnace, Gas, Capacity = 60 kBtu/h  
 Proposed Efficiency = 80.00% Ec, Required Efficiency = 80.00% Ec  
 Cooling: 1 each - Single Package DX Unit, Capacity = 36 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 17.50 SEER, Required Efficiency = 13.00 SEER  
 Fan System: 3.0 ton HVAC -- Compliance (Motor nameplate HP method) : Passes
- Fans:  
 FAN 11 Supply, Constant Volume, 1200 CFM, 0.8 motor nameplate hp
- 2 HVAC System 7 (Single Zone) :  
 Heating: 1 each - Duct Furnace, Gas, Capacity = 60 kBtu/h  
 Proposed Efficiency = 80.00% Ec, Required Efficiency = 80.00% Ec  
 Cooling: 1 each - Single Package DX Unit, Capacity = 50 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 17.50 SEER, Required Efficiency = 13.00 SEER  
 Fan System: 4.0 ton HVAC -- Compliance (Motor nameplate HP method) : Passes
- Fans:  
 FAN 12 Supply, Constant Volume, 1600 CFM, 1.0 motor nameplate hp
- 1 HVAC System 8 (Single Zone) :  
 Heating: 1 each - Duct Furnace, Electric, Capacity = 80 kBtu/h  
 No minimum efficiency requirement applies  
 Cooling: 1 each - Single Package DX Unit, Capacity = 72 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 16.50 EER, Required Efficiency = 11.20 EER  
 Fan System: 6 ton HVAC -- Compliance (Motor nameplate HP method) : Passes
- Fans:  
 FAN 13 Supply, Constant Volume, 2000 CFM, 1.5 motor nameplate hp

## Section 4: Requirements Checklist

### Requirements Specific To: HVAC System 1 :

- 1. Equipment minimum efficiency: Heat Pump: 4.20 COP 11.20 EER
- 2. Minimum one temperature control device per zone
- 3. Heat pump thermostat required when supplemental electric resistance heat is installed
- 4. Systems serving more than one zone must be VAV systems
- 5. Loop temperature controlled with 20 degrees F deadband where neither cooling tower/fluid cooler nor boiler can operate
- 6. Two-position valve on each heat pump having total heat pump system power >10hp
- 7. Open- or closed-circuit cooling tower has a separate heat exchanger that isolates the cooling tower from the heat pump loop, and a means of shutting down the circulation pump on the cooling tower loop, and an automatic valve to stop all flow of fluid.
- 8. Controls capable of resetting supply air temp (SAT) by 25% of SAT-room temp difference  
*Exception(s):*
  - Systems that prevent reheating, recooling or mixing of heated and cooled supply air
  - Seventy five percent of the energy for reheating is from site-recovered or site solar energy sources.
  - Zones with peak supply air quantities of 300 cfm (142 L/s) or less.
- 9. VAV fans with static pressure sensors are placed in a position such that the controller setpoint is no greater than one-third the total design fan static pressure. If placement results in the sensor being located downstream of major duct splits, multiple sensors are installed in each major branch.  
*Exception(s):*
  - Systems with DDC of individual zone boxes reporting to the central control panel and reset of static pressure setpoint based on the zone requiring the most pressure.
- 10. Systems with DDC of individual zone boxes reporting to the central control panel has static pressure setpoint reset based on the zone requiring the most pressure.

### Requirements Specific To: HVAC System 2 :

- 1. Equipment minimum efficiency: Heat Pump: 4.20 COP 11.20 EER

- 2. Heat pump thermostat required when supplemental electric resistance heat is installed
- 3. Loop temperature controlled with 20 degrees F deadband where neither cooling tower/fluid cooler nor boiler can operate
- 4. Two-position valve on each heat pump having total heat pump system power >10hp
- 5. Open- or closed-circuit cooling tower has a separate heat exchanger that isolates the cooling tower from the heat pump loop, and a means of shutting down the circulation pump on the cooling tower loop, and an automatic valve to stop all flow of fluid.

**Requirements Specific To: HVAC System 3 :**

- 1. Equipment minimum efficiency: Heat Pump: 4.20 COP 11.20 EER
- 2. Heat pump thermostat required when supplemental electric resistance heat is installed
- 3. Loop temperature controlled with 20 degrees F deadband where neither cooling tower/fluid cooler nor boiler can operate
- 4. Two-position valve on each heat pump having total heat pump system power >10hp
- 5. Open- or closed-circuit cooling tower has a separate heat exchanger that isolates the cooling tower from the heat pump loop, and a means of shutting down the circulation pump on the cooling tower loop, and an automatic valve to stop all flow of fluid.

**Requirements Specific To: HVAC System 4 :**

- 1. Equipment minimum efficiency: Heat Pump: 4.20 COP 11.20 EER
- 2. Heat pump thermostat required when supplemental electric resistance heat is installed
- 3. Loop temperature controlled with 20 degrees F deadband where neither cooling tower/fluid cooler nor boiler can operate
- 4. Two-position valve on each heat pump having total heat pump system power >10hp
- 5. Open- or closed-circuit cooling tower has a separate heat exchanger that isolates the cooling tower from the heat pump loop, and a means of shutting down the circulation pump on the cooling tower loop, and an automatic valve to stop all flow of fluid.

**Requirements Specific To: HVAC System 5 :**

- 1. Equipment minimum efficiency: Heat Pump: 4.20 COP 12.00 EER
- 2. Heat pump thermostat required when supplemental electric resistance heat is installed
- 3. Loop temperature controlled with 20 degrees F deadband where neither cooling tower/fluid cooler nor boiler can operate
- 4. Two-position valve on each heat pump having total heat pump system power >10hp
- 5. Open- or closed-circuit cooling tower has a separate heat exchanger that isolates the cooling tower from the heat pump loop, and a means of shutting down the circulation pump on the cooling tower loop, and an automatic valve to stop all flow of fluid.

**Requirements Specific To: HVAC System 6 :**

- 1. Equipment minimum efficiency: Duct Furnace (Gas): 80.00 % Ec
- 2. Equipment minimum efficiency: Single Package Unit: 13.00 SEER

**Requirements Specific To: HVAC System 7 :**

- 1. Equipment minimum efficiency: Duct Furnace (Gas): 80.00 % Ec
- 2. Equipment minimum efficiency: Single Package Unit: 13.00 SEER

**Requirements Specific To: HVAC System 8 :**

- 1. Equipment minimum efficiency: Single Package Unit: 11.20 EER
- 2. Integrated economizer is required for this location and system.
- 3. Cooling system provides a means to relieve excess outdoor air during economizer operation.

**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
- 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
10. Hot water pipe insulation: 1.5 in. for pipes  $\leq 1.5$  in. and 2 in. for pipes  $> 1.5$  in.  
 Chilled water/refrigerant/brine pipe insulation: 1.5 in. for pipes  $\leq 1.5$  in. and 1.5 in. for pipes  $> 1.5$  in.  
 Steam pipe insulation: 1.5 in. for pipes  $\leq 1.5$  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 603.17
14. Demand control ventilation (DCV) present for high design occupancy areas ( $> 40$  person/1000 ft<sup>2</sup> in spaces  $> 500$  ft<sup>2</sup>) 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. Motorized, automatic shutoff dampers required on exhaust and outdoor air supply openings  
 Exception(s):
- Gravity dampers acceptable in buildings  $< 3$  stories
16. Automatic controls for freeze protection systems present
17. 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

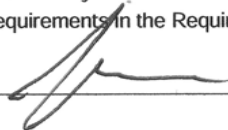
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KURT MAGNUSSON, P.E.

Name - Title

MECHANICAL ENGINEER

Signature



Date

12/29/16

## Section 6: Post Construction Compliance Statement

- HVAC record drawings of the actual installation, system capacities, calibration information, and performance data for each equipment provided to the owner.
- HVAC O&M documents for all mechanical equipment and system provided to the owner by the mechanical contractor.
- Written HVAC balancing and operations report provided to the owner.

The above post construction requirements have been completed.

\_\_\_\_\_  
Principal Mechanical Designer-Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date