



COMcheck Software Version 4.0.6.1 Envelope Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**
 Project Title: Hall Elementary School
 Project Type: New Construction

Construction Site:
 23 Orono Road
 Portland, ME 04102

Owner/Agent:
 City of Portland
 389 Congress St
 Portland, ME 04101

Designer/Contractor:
 Tyler Barter
 Oak Point Associates
 231 main St
 Biddeford, ME 04101
 207-283-0193
 tbarter@oakpoint.com

Building Location (for weather data): Portland, Maine
 Climate Zone: 6a
 Vertical Glazing / Wall Area Pct.: **16%**
 Skylight Glazing / Roof Area Pct.: **0%**

Building Use: Activity Type(s)	Floor Area
1-School/University : Nonresidential	84000

Section 2: Envelope Assemblies and Requirements Checklist

Envelope PASSES: Design 9% better than code.

Envelope Assemblies:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor ^(a)
Roof 1: Insulation Entirely Above Deck, [Bldg. Use 1 - School/University]	60310	---	38.0	0.026	0.048
Skylight 1: Metal Frame with Thermal Break:Glass, With Curb, Perf. Specs.: Product ID WPC-A-9-00005-00001, SHGC 0.35, [Bldg. Use 1 - School/University] (b)	128	---	---	0.350	0.600
Exterior Wall 1: Steel-Framed, 16" o.c., [Bldg. Use 1 - School/University]	37961	0.0	17.5	0.049	0.064
Window 1: Metal Frame with Thermal Break, Perf. Type: Energy code default, Double Pane with Low-E, Clear , SHGC 0.70, [Bldg. Use 1 - School/University]	1572	---	---	0.650	0.550
Window 2: Metal Frame with Thermal Break, Perf. Type: Energy code default, Double Pane with Low-E, Tinted , SHGC 0.60, [Bldg. Use 1 - School/University]	2040	---	---	0.650	0.550
Window 3: Metal Frame Curtain Wall/Storefront, Perf. Specs.: Product ID YCW 750XTC, YKK AP, SHGC 0.35, [Bldg. Use 1 - School/University] (b)	2444	---	---	0.360	0.450
Door 1: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Type: Energy code default, Double Pane with Low-E, Clear , SHGC 0.70, [Bldg. Use 1 - School/University]	462	---	---	0.800	0.800
Door 2: Insulated Metal, Swinging, [Bldg. Use 1 - School/University]	252	---	---	0.400	0.700
Exterior Wall 2: Concrete Block:8", Solid Grouted,Medium Density , Furring: None, [Bldg. Use 1 - School/University]	1778	---	17.5	0.051	0.080
Floor 1: Slab-On-Grade:Heated, Horizontal with vertical >= 4 ft., [Bldg. Use 1 - School/University]	2058	---	10.0	---	---

(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.



COMcheck Software Version 4.0.6.1 Interior Lighting Compliance Certificate

Section 1: Project Information

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207-283-0193
tbarter@oakpoint.com

Section 2: Interior Lighting and Power Calculation

A Area Category	B Floor Area (ft ²)	C Allowed Watts / ft ²	D Allowed Watts (B x C)
School/University	84000	1.2	100800
Total Allowed Watts =			100800

Section 3: Interior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
School/University (84000 sq.ft.)				
LED 1: A8: Other:	1	10	87.2	872
LED 2: A12: Other:	1	14	130.8	1831.2
LED 3: A16: Other:	1	10	174.4	1744
LED 4: A20: Other:	1	56	218	12208
LED 5: B8: Other:	1	2	65.6	131.2
LED 6: C4: Other:	1	1	29.2	29.2
LED 7: C8: Other:	1	14	58.4	817.6
LED 8: C12: Other:	1	5	87.6	438
LED 9: D1: Other:	1	7	70	490
LED 10: F1: Other:	1	17	25	425
LED 11: F2: Other:	1	5	65	325
LED 12: F3: Other:	1	8	35	280
LED 13: F4: Other:	1	43	40	1720
LED 14: F5: Other:	1	60	30	1800
LED 15: F6: Other:	1	14	25	350
LED 16: F7: Other:	1	42	18.4	772.8
LED 17: F8: Other:	1	19	35	665
LED 18: F9: Other:	1	49	53	2597
LED 19: F10: Other:	1	20	47	940
LED 20: F11: Other:	1	16	217	3472
LED 21: F12: Other:	1	20	31	620
LED 22: F13: Other:	1	4	34	136
LED 23: F14: Other:	1	4	27	108
LED 24: F15: Other:	1	21	20	420
LED 25: F16: Other:	1	2	47	94
LED 26: F18: Other:	1	12	26	312

MATTHEW LAFOND - ELECTRICAL
Name - Title

Matth Lafond
Signature

6/12/17
Date

Section 4: Requirements Checklist

Lighting Wattage:

1. Within each non-tradable area/surface, total proposed watts must be less than or equal to total allowed watts. Across all tradable areas/surfaces, total proposed watts must be less than or equal to total allowed watts.
Compliance: Passes.

Controls, Switching, and Wiring:

2. All exemption claims are associated with fixtures that have a control device independent of the control of the nonexempt lighting.
 3. Lighting not designated for dusk-to-dawn operation is controlled by either a photosensor (with time switch), or an astronomical time switch.
 4. Lighting designated for dusk-to-dawn operation is controlled by an astronomical time switch or photosensor.
 5. All time switches are capable of retaining programming and the time setting during loss of power for a period of at least 10 hours.

Exterior Lighting Efficacy:

6. All exterior building grounds luminaires that operate at greater than 100W have minimum efficacy of 60 lumen/watt.

Exceptions:

- Lighting that has been claimed as exempt and is identified as such in Section 3 table above.
 Lighting that is specifically designated as required by a health or life safety statute, ordinance, or regulation.
 Emergency lighting that is automatically off during normal building operation.
 Lighting that is controlled by motion sensor.

Section 5: Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2009 IECC requirements in COMcheck Version 4.0.6.1 and to comply with the mandatory requirements in the Requirements Checklist.

MATTHEW LAFOND - ELECTRICAL
 Name - Title


 Signature

6/12/17
 Date

- Fully ducted return and/or exhaust air systems, 0.2397 credit
 Particulate filtration credit: MERV 13 through 15, 0.4314 credit
 Heat recovery device, 0.5392 credit
 Exhaust filters, scrubbers, or other exhaust treatment, 0.2777 credit
- 1 AHU-4 (Multiple-Zone) :
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 174 kBtu/h
 No minimum efficiency requirement applies
 Cooling: 1 each - Hydronic Coil, Capacity = 250 kBtu/h, Air Economizer
 No minimum efficiency requirement applies
 Fan System: AHU-4 | MAIN OFFICES/LIBRARY -- Compliance (Brake HP method) : Passes
- Fans:
 FAN 7 Supply, Multi-Zone VAV, 6520 CFM, 10.0 motor nameplate hp, 8.3 design brake hp (9.3 max. BHP)
 FAN 8 Exhaust, Multi-Zone VAV, 5870 CFM, 7.5 motor nameplate hp, 5.5 design brake hp (5.5 max. BHP)
- Pressure Drop Credits:
 Fully ducted return and/or exhaust air systems, 0.7892 credit
 Heat recovery device, 2.5569 credit
 Exhaust filters, scrubbers, or other exhaust treatment, 0.8810 credit
 Particulate filtration credit: MERV 13 through 15, 1.4205 credit
- 1 AHU-5 (Multiple-Zone) :
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 121 kBtu/h
 No minimum efficiency requirement applies
 Cooling: 1 each - Hydronic Coil, Capacity = 140 kBtu/h, Air Economizer
 No minimum efficiency requirement applies
 Fan System: AHU-5 | OT/PT.FLS -- Compliance (Brake HP method) : Passes
- Fans:
 FAN 16 Supply, Multi-Zone VAV, 3000 CFM, 5.0 motor nameplate hp, 3.8 design brake hp (3.8 max. BHP)
 FAN 17 Exhaust, Multi-Zone VAV, 2660 CFM, 3.0 motor nameplate hp, 2.1 design brake hp (2.1 max. BHP)
- Pressure Drop Credits:
 Fully ducted return and/or exhaust air systems, 0.3631 credit
 Particulate filtration credit: MERV 13 through 15, 0.6536 credit
 Heat recovery device, 1.1445 credit
 Exhaust filters, scrubbers, or other exhaust treatment, 0.3883 credit
- 1 AHU-6 (Multiple-Zone) :
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 393 kBtu/h
 No minimum efficiency requirement applies
 Fan System: AHU-6 | PRE-K/KINGERGARTEN -- Compliance (Brake HP method) : Passes
- Fans:
 FAN 9 Supply, Multi-Zone VAV, 5190 CFM, 5.0 motor nameplate hp, 4.9 design brake hp (4.9 max. BHP)
 FAN 11 Exhaust, Multi-Zone VAV, 4285 CFM, 5.0 motor nameplate hp, 3.1 design brake hp (3.1 max. BHP)
- Pressure Drop Credits:
 Fully ducted return and/or exhaust air systems, 0.6282 credit
 Heat recovery device, 1.3204 credit
 Exhaust filters, scrubbers, or other exhaust treatment, 0.6141 credit
 Particulate filtration credit: MERV 13 through 15, 1.1307 credit
- 1 AHU-7 (Multiple-Zone) :
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 497 kBtu/h
 No minimum efficiency requirement applies
 Fan System: AHU-7 | GRADES 1/2 -- Compliance (Brake HP method) : Passes
- Fans:
 FAN 12 Supply, Multi-Zone VAV, 6575 CFM, 7.5 motor nameplate hp, 7.3 design brake hp (7.3 max. BHP)
 FAN 13 Exhaust, Multi-Zone VAV, 6140 CFM, 5.0 motor nameplate hp, 4.6 design brake hp (4.6 max. BHP)
- Pressure Drop Credits:
 Fully ducted return and/or exhaust air systems, 0.7958 credit
 Heat recovery device, 1.7672 credit
 Particulate filtration credit: MERV 13 through 15, 1.4325 credit
 Exhaust filters, scrubbers, or other exhaust treatment, 0.9995 credit
- 1 AHU-8 (Multiple-Zone) :
 Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 661 kBtu/h
 No minimum efficiency requirement applies
 Fan System: AHU-8 | GRADES 3/4/5 -- Compliance (Brake HP method) : Passes
- Fans:
 FAN 14 Supply, Multi-Zone VAV, 8745 CFM, 10.0 motor nameplate hp, 9.5 design brake hp (9.5 max. BHP)
 FAN 15 Exhaust, Multi-Zone VAV, 8255 CFM, 7.3 motor nameplate hp, 6.7 design brake hp (6.7 max. BHP)
- Pressure Drop Credits:
 Fully ducted return and/or exhaust air systems, 1.0585 credit

Section 4: Requirements Checklist

Requirements Specific To: AHU-1 :

- 1. Minimum one temperature control device per zone
- 2. Balancing and pressure test connections on all hydronic terminal devices
- 3. Systems serving more than one zone must be VAV systems
- 4. Single-duct VAV terminals reduce primary air before reheating
- 5. 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.
- 6. 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.
- 7. 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.
- 8. Hot water pumping systems with multiple boilers automatically reduce hot water flow rates proportionately when boilers are not operating

Requirements Specific To: AHU-2 :

- 1. Minimum one temperature control device per zone
- 2. Balancing and pressure test connections on all hydronic terminal devices
- 3. Systems serving more than one zone must be VAV systems
- 4. Single-duct VAV terminals reduce primary air before reheating
- 5. 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.
- 6. 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.
- 7. 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.
- 8. Hot water pumping systems with multiple boilers automatically reduce hot water flow rates proportionately when boilers are not operating

Requirements Specific To: AHU-3 :

- 1. Minimum one temperature control device per zone
- 2. Balancing and pressure test connections on all hydronic terminal devices
- 3. Systems serving more than one zone must be VAV systems
- 4. Single-duct VAV terminals reduce primary air before reheating
- 5. 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.
- 6. 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 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.
11. 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.
12. 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.
13. Meets the condenser heat recovery requirement for service water heating

Exception(s):

- Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30% of the peak water-cooled condenser load at design conditions.
 - Facilities that provide 60% of their service water heating from site solar or site recovered energy or from other sources.
14. Chilled water pumping systems with multiple chillers must automatically reduce chilled water flow rates proportionately when chillers are not operating
15. Hot water pumping systems with multiple boilers automatically reduce hot water flow rates proportionately when boilers are not operating

Requirements Specific To: AHU-6 :

- 1. Minimum one temperature control device per zone
- 2. Balancing and pressure test connections on all hydronic terminal devices
- 3. Systems serving more than one zone must be VAV systems
- 4. Single-duct VAV terminals reduce primary air before reheating
- 5. 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.
6. 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.
7. 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.
8. Hot water pumping systems with multiple boilers automatically reduce hot water flow rates proportionately when boilers are not operating

Requirements Specific To: AHU-7 :

- 1. Minimum one temperature control device per zone
- 2. Balancing and pressure test connections on all hydronic terminal devices
- 3. Systems serving more than one zone must be VAV systems
- 4. Single-duct VAV terminals reduce primary air before reheating
- 5. 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.
6. 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.
7. 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.

- 1. Equipment minimum efficiency: Boiler Thermal Efficiency 75% Et 80% Ec
- 2. Newly purchased heating equipment meets the efficiency requirements
- used equipment must meet 80% Et @ maximum capacity
- 3. Systems with multiple boilers have automatic controls capable of sequencing boiler operation
- 4. Hydronic heating systems comprised of a single boiler and >500 kBtu/h input design capacity include either a multistaged or modulating burner

Requirements Specific To: Water Heater 1 :

- 1. Water heating equipment meets minimum efficiency requirements: Gas Storage Water Heater efficiency: 80.00 % Et (135 SL, kBtu/h)
- 2. First 8 ft of outlet piping is insulated
- 3. All heat traced or externally heated piping insulated
- 4. Hot water storage temperature controls that allow setpoint of 90°F for non-dwelling units and 110°F for dwelling units.
- 5. Automatic time control of heat tapes and recirculating systems present
- 6. Heat traps provided on inlet and outlet of storage tanks

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 <=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. Hot water distribution systems >= 300 kBtu/h must have one of the following:
 - a) controls that reset supply water temperature by 25% of supply/return delta T
 - b) mechanical or electrical adjustable-speed pump drive(s)
 - c) two-way valves at all heating coils
 - d) multiple-stage pumps
 - e) other system controls that reduce pump flow by at least 50% based on load
- calculations required*Exception(s):*
 - Where the supply temperature reset controls cannot be implemented without causing improper operation of heating, cooling, humidification, or dehumidification systems.