COM*check* Software Version 4.0.8.1

Mechanical Compliance Certificate

Section 1: Project Information

Energy Code: **2014 Oregon Energy Efficiency Specialty Code**
Project Title: Pilot Butte Middle School
Project Type: New Construction

Construction Site:
1501 NE Neff Rd
Bend, OR 97701

Owner/Agent:

Designer/Contractor:
Takako Baker
MFIA, Inc.
2007 SE Ash Street
Portland, OR 97213
503-234-0548
takako.baker@mfia-eng.com

Section 2: General Information

Building Location (for weather data): Bend, Oregon
Climate Zone: 5b

Section 3: Mechanical Systems List

Quantity **System Type & Description**

1 AHU-E1 (Multiple-Zone) :
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 84 kBtu/h
No minimum efficiency requirement applies
Fan System: AHU-E1 | offices -- Compliance (Brake HP method) : Passes

Fans:
FAN 1 Supply, Multi-Zone VAV, 4350 CFM, 7.5 motor nameplate hp, 4.0 design brake hp (4.0 max. BHP)
FAN 5 Return, Single-Zone VAV, 3995 CFM, 5.0 motor nameplate hp, 2.0 design brake hp (4.0 max. BHP)
Pressure Drop Credits:
Fully ducted return and/or exhaust air systems, 0.5247 credit

1 AHU-E2 (Multiple-Zone) :
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 174 kBtu/h
No minimum efficiency requirement applies
Fan System: AHU-E2 -- Compliance (Brake HP method) : Passes

Fans:
FAN 2 Supply, Multi-Zone VAV, 6185 CFM, 7.5 motor nameplate hp, 5.6 design brake hp (5.6 max. BHP)
FAN 4 Return, Single-Zone VAV, 5410 CFM, 5.0 motor nameplate hp, 3.0 design brake hp (3.0 max. BHP)
Pressure Drop Credits:
Fully ducted return and/or exhaust air systems, 0.6548 credit

Section 4: Requirements Checklist

In the following requirements, blank checkboxes identify requirements that the applicant has not acknowledged as being met. Checkmarks identify requirements that the applicant acknowledges are met or excepted from compliance. 'Plans reference page/section' identifies where in the plans/specs the requirement can be verified as being satisfied.

Requirements Specific To: AHU-E1 :

✔ 1. Energy recovery ventilation systems. Individual fan systems that have both a design supply air capacity of 5,000 cfm or greater and a minimum outside air supply of 70 percent or greater of the design supply air quantity have an energy recovery system.

Plans reference page/section: *NA*

✔ 2. Complex Systems. Mechanical systems not covered by section 503.3 comply to sections 503.4.1 - 503.4.6.

Plans reference page/section: *M6.0, Specification 237400*

✔ 3. Variable air volume fan control. Individual VAV fans with motors of 10 hp or greater are driven/controlled in the manner specified by this section.

Plans reference page/section: *M6.0*

✔ 4. Hydronic systems controls. The heating of fluids that have been previously mechanically cooled and the cooling of fluids that have been previously mechanically heated are limited in accordance with Sections 503.4.3.1 through 503.4.3.3.

Plans reference page/section: *M6.0, Specification 238000*

✔ 5. Three-pipe system. Hydronic systems that use a common return system for both hot water and chilled water are not installed.

Plans reference page/section: *NA*

✔ 6. Two-pipe changeover system. Systems that use a common distribution system to supply both heated and chilled water are designed to allow a dead band between changeover from one mode to the other; are provided with controls that will allow operation in one mode for at least 4 hours before changing over to the other mode; and are provided with controls that allow heating and cooling supply temperatures at the changeover point.

Plans reference page/section: *NA*

✔ 7. Hydronic (water loop) heat pump systems. Hydronic heat pump systems comply with Sections 503.4.3.3.1 through 503.4.3.3.3.

Plans reference page/section: *NA*

✔ 8. Temperature dead band. Hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection and heat addition have controls that are capable of providing a heat pump water supply temperature dead band of at least 20°F between initiation of heat rejection and heat addition by the central devices.

Plans reference page/section: *NA*

✔ 9. Heating and Cooling Water Pump Control. Water circulation systems serving heating coil(s) or cooling coil(s) have controls that lock out pump operation when there is no demand. The pumps will shut off based on the outside air lock out temperatures.

Plans reference page/section: *Existing*

✔ 10.Requirements For Complex Mechanical Systems Serving Multiple Zones.

Complex systems serving multiple zones comply with Sections 503.4.5.1 through 503.4.5.4 Additionally, supply air systems serving multiple zones are VAV systems which are designed and capable of being controlled to reduce primary air supply to each zone, the volume of air that is reheated/recooled/mixed in peak heating demand, and modulate airflow between deadband and full heating/cooling.

Plans reference page/section: *M6.0*

✔ 11.Single duct variable air volume (VAV) systems, terminal devices. Single duct VAV systems use terminal devices capable of reducing the supply of primary supply air before reheating or recooling takes place.

Plans reference page/section: *M6.0, Spec 233000*

✔ 12.Supply-air temperature reset controls. HVAC systems serving multiple zones, including Dedicated Outside Air Systems include controls that automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperature.

Plans reference page/section: *M6.0*

✔ 13.Heat Recovery For Pool/Spa/Hottubs. Heated indoor swimming pools, spas, or hot tubs with water surface area greater than 200 sf provide for energy conservation by an exhaust air heat recovery system that heats ventilation air, pool water, or domestic hot water per requirement details.

Plans reference page/section: *NA*

Requirements Specific To: AHU-E2 :

✔ 1. Energy recovery ventilation systems. Individual fan systems that have both a design supply air capacity of 5,000 cfm or greater and a minimum outside air supply of 70 percent or greater of the design supply air quantity have an energy recovery system.

Plans reference page/section: *NA*

✔ 2. Complex Systems. Mechanical systems not covered by section 503.3 comply to sections 503.4.1 - 503.4.6.

Plans reference page/section: *M6.0, Specification 237400*

✔ 3. Variable air volume fan control. Individual VAV fans with motors of 10 hp or greater are driven/controlled in the manner specified by this section.

Plans reference page/section: *M6.0*

✔ 4. Hydronic systems controls. The heating of fluids that have been previously mechanically cooled and the cooling of fluids that have been previously mechanically heated are limited in accordance with Sections 503.4.3.1 through 503.4.3.3.

Plans reference page/section: *M6.0, Specification 238000*

✔ 5. Three-pipe system. Hydronic systems that use a common return system for both hot water and chilled water are not installed.

Plans reference page/section: *NA*

✔ 6. Two-pipe changeover system. Systems that use a common distribution system to supply both heated and chilled water are designed to allow a dead band between changeover from one mode to the other; are provided with controls that will allow operation in one mode for at least 4 hours before changing over to the other mode; and are provided with controls that allow heating and cooling supply temperatures at the changeover point.

Plans reference page/section: *NA*

✔ 7. Hydronic (water loop) heat pump systems. Hydronic heat pump systems comply with Sections 503.4.3.3.1 through 503.4.3.3.3.

Plans reference page/section: *NA*

✔ 8. Temperature dead band. Hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection and heat addition have controls that are capable of providing a heat pump water supply temperature dead band of at least 20°F between initiation of heat rejection and heat addition by the central devices.

Plans reference page/section: *NA*

✔ 9. Heating and Cooling Water Pump Control. Water circulation systems serving heating coil(s) or cooling coil(s) have controls that lock out pump operation when there is no demand. The pumps will shut off based on the outside air lock out temperatures.

Plans reference page/section: *Existing conditions*

✔ 10.Requirements For Complex Mechanical Systems Serving Multiple Zones.

Complex systems serving multiple zones comply with Sections 503.4.5.1 through 503.4.5.4 Additionally, supply air systems serving multiple zones are VAV systems which are designed and capable of being controlled to reduce primary air supply to each zone, the volume of air that is reheated/recooled/mixed in peak heating demand, and modulate airflow between deadband and full heating/cooling.

Plans reference page/section: *M6.0*

✔ 11.Single duct variable air volume (VAV) systems, terminal devices. Single duct VAV systems use terminal devices capable of reducing the supply of primary supply air before reheating or recooling takes place.

Plans reference page/section: *M6.0, Spec 233000*

✔ 12.Supply-air temperature reset controls. HVAC systems serving multiple zones, including Dedicated Outside Air Systems include controls that automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperature.

Plans reference page/section: *M6.0*

✔ 13.Heat Recovery For Pool/Spa/Hottubs. Heated indoor swimming pools, spas, or hot tubs with water surface area greater than 200 sf provide for energy conservation by an exhaust air heat recovery system that heats ventilation air, pool water, or domestic hot water per requirement details.

Plans reference page/section: *NA*

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

✔ 1. Calculation of heating and cooling loads. Design loads are determined in accordance with the procedures described in the ASHRAE/ACCA Standard 183. Alternatively, design loads have been determined by an approved equivalent computation procedure.

✔ 2. Equipment and system sizing. Heating and cooling equipment and systems capacity do not exceed the loads calculated in accordance with Section 503.2.1.

Plans reference page/section: *Existing Heating System/No cooling*

✔ 3. Thermostatic Controls. The supply of heating and cooling energy to each zone is controlled by individual thermostatic controls that respond to temperature within the zone.

Plans reference page/section: *M2.02A, B, M2.03*

✔ 4. Set point overlap restriction. Where used to control both heating and cooling, zone thermostatic controls provide a temperature range or deadband of at least 5°F (2.8°C) within which the supply of heating and cooling energy to the zone is capable of being shut off or reduced to a minimum.

Plans reference page/section: *Spec 233000*

✔ 5. Optimum Start Controls. Each HVAC system has controls that vary the start-up time of the system to just meet the temperature set point at time of occupancy.

Plans reference page/section: *M6.0*

✔ 6. Off-hour controls. Each zone is provided with thermostatic setback controls that are controlled by either an automatic time clock or programmable control system.

Plans reference page/section: *M6.0*

✔ 7. Shutoff damper controls. Both outdoor air supply and exhaust are equipped with not less than Class I motorized dampers.

Plans reference page/section: *Spec 233000*

✔ 8. Freeze Protection and Snow melt system controls. Freeze protection systems, such as heat tracing of outdoor piping and heat exchangers, including self-regulating heat tracing, include automatic controls capable of shutting off the systems when outdoor air temperatures meet code criteria.

Plans reference page/section: *Spec 221000, 220500*

✔ 9. Separate air distribution systems. Zones with special process temperature requirements and/or humidity requirements are served by separate air distribution systems from those serving zones requiring only comfort conditions; or shall include supplementary control provisions so that the primary systems may be specifically controlled for comfort purposes only.

✓ **Exception applies:** [503.2.4.8 +] Zones requiring only comfort heating or comfort cooling that are served by a system primarily used for process temperature and humidity control.

Plans reference page/section: *M2.02A, B, M2.03*

✔ 10.Humidity control. If a system is equipped with a means to add or remove moisture to maintain specific humidity levels in a zone or zones, a humidity control device is provided.

Plans reference page/section: *NA*

✔ 11.Humidity control. Where a humidity control device exists it is set to prevent the use of fossil fuel or electricity to produce relative humidity in excess of 30 percent. Where a humidity control device is used for dehumidification, it is set to prevent the use of fossil fuel or electricity to reduce relative humidity below 60 percent.

Plans reference page/section: *NA*

✔ 12.Humidity control. Where a humidity control device exists it is set to maintain a deadband of at least 10% relative humidity where no active humidification or dehumidification takes place.

Plans reference page/section: *NA*

✔ 13.Ventilation. Ventilation, either natural or mechanical, is provided in accordance with Chapter 4 of the International Mechanical Code. Where mechanical ventilation is provided, the system has the capability to reduce the outdoor air supply to the minimum required by Chapter 4 of the International Mechanical Code.

Plans reference page/section: *M6.1*

✔ 14.Demand controlled ventilation (DCV). DCV is required for spaces larger than 500 ft2 for simple systems and spaces larger than 150 ft2 for multiple zone systems.

Plans reference page/section: *M2.02B, M2.03*

✔ 15.Kitchen hoods. Kitchen makeup is provided as required by the Oregon Mechanical Specialty Code.

Plans reference page/section: *NA*

✔ 16.Enclosed parking garage ventilation controls. In Group S-2, enclosed parking garages used for storing or handling automobiles employs automatic carbon monoxide sensing devices.

Plans reference page/section: *NA*

✔ 17.Duct and plenum insulation and sealing. All supply and return air ducts and plenums are insulated with the specified insulation. When located within a building envelope assembly, the duct or plenum is separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8 insulation. All ducts, air handlers and filter boxes are sealed. Joints and seams comply with Section 603.9 of the International Mechanical Code.

✔ 18.Medium-pressure duct systems. All ducts and plenums designed to operate medium-pressure are insulated and sealed in accordance with Section 503.2.7. Pressure classifications specific to the duct system are clearly indicated on the construction documents.

Plans reference page/section: *Specification 230700*

✔ 19.Piping Insulation. All pipes serving space-conditioning systems (hot water piping for heat systems, chilled water, refrigerant, and brine piping systems, and steam piping) are insulated as specified by this section.

✔ 20.Air system balancing. Each supply air outlet and zone terminal device is equipped with means for air balancing in accordance with the requirements of IMC 603.17. Discharge dampers intended to modulate airflow are prohibited on constant volume fans and variable volume fans with motors 10 horsepower.

Plans reference page/section: *Spec 230593*

✔ 21.Hydronic system balancing. Individual hydronic heating and cooling coils are equipped with means for balancing and pressure test connections.

Plans reference page/section: *Spec 23093*

✔ 22.Manuals. The construction documents require that an operating and maintenance manual be provided to the building owner by the mechanical contractor. See long description for specifications.

Plans reference page/section: *Spec 220500, 230500*

✔ 23.Air System Design and Control. Each HVAC system having a total fan system motor nameplate hp exceeding 5 hp meets the provisions of Sections 503.2.10.1 through 503.2.10.2.

Plans reference page/section: *M6.0*

✔ 24.Allowable fan floor horsepower. Each HVAC system at fan system design conditions does not exceed the allowable fan system motor nameplate hp (Option 1) or fan system bhp (Option 2) as shown and calulated in requirement details.

Plans reference page/section: *M6.0*

✔ 25.Motor nameplate horsepower. For each fan, the selected fan motor is no larger than the first available motor size greater than the brake horsepower (bhp).

Plans reference page/section: *M6.0*

✔ 26.Large Volume Fan Systems. Fan systems over 8,000 (7 m3/s) cfm without direct expansion cooling coils that serve single zones reduce airflow based on space thermostat heating and cooling demand. A two-speed motor or variable frequency drive reduces airflow to a maximum 60 percent of peak airflow or minimum ventilation air requirement as required by Chapter 4 of the International Mechanical Code, whichever is greater.

Plans reference page/section: *NA*

✔ 27.All air-conditioning equipment and air-handling units with direct expansion cooling and a cooling capacity at ARI conditions greater than or equal to 110,000 Btu/h that serve single zones have their supply fan operation controlled according to code specific requirements.

Plans reference page/section: *NA*

✔ 28.Series fan-powered terminal unit fan motors. Fan motors for series fan-powered terminal units are electronically-commutated motors and have a minimum motor efficiency of 70 percent when rated in accordance with NEMA Standard MG 1-2006 at full load rating conditions.

Plans reference page/section: *NA*

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 2014 Oregon Energy Efficiency Specialty Code requirements in COM*check* Version 4.0.8.1 and to comply with the mandatory requirements in the Requirements Checklist.

Takako Baker, Mechanical Engineer	Takako Baker	2/8/18
Name - Title	Signature	Date

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