



Northwest ENERGY STAR® Homes Approved Technical Compliance Options Summary

TCO : Natural Gas Fired Hydronic Heating Systems (Washington)	
Option Type:	Alternate Path to meet 2011 Washington BOP
Submitted By:	NEEA
Date Approved:	March, 2011
Description:	Substitute a hot water heating distribution system based on radiant floors, fan coils or radiators. All distribution is located in the conditioned envelope or in insulated piping. Water heating equipment is located within the conditioned envelope. Heating fuel shall be natural gas.
References:	<ol style="list-style-type: none"> 1. WABOP 1. 2. Hydronic System Specification, attached.
Requirements for this Alternate Path that exceed Oregon State Energy Code:	<ol style="list-style-type: none"> 1. This TCO applies to ENERGY STAR homes in Washington only. 2. All envelope, ventilation, and appliance/lighting requirements specified in WABOP 1 for gas furnaces would apply to this TCO, except that added requirements for the DHW system or altered requirements for the envelope shall be those specified in this TCO. 3. The space and water heating systems shall be supplied by a water heater and/or boiler with a minimum efficiency rating of either 0.82 (Path A) or 0.90 (Path B). 4. If Path A is employed, the water heater shall be rated at a minimum EF of 0.82, the "Recovery Efficiency" shall be .82, as rated under provisions of the AHRI Certified Ratings, and the effective U-value of the wall assembly shall be 0.043 or less. In addition, the window U-value shall be no more than U- 0.25. 5. If the water heater is rated at a minimum EF of 0.90 (Path B), with a Recovery Efficiency of 0.92 or better, no additional wall and window envelope upgrades are required. 6. For radiant slab on grade construction, R-15 full under slab insulation with minimum R-5 thermal break at slab edge is required. 7. Pipe insulation shall meet the provisions of the local code for 150°F average hot water delivery temperature.

Hydronic Heating Systems and Building Service Water

1.1. General

This section focuses on the equipment and installation standards for hydronic heating and domestic hot water (DHW) applied to ENERGY STAR homes constructed under the Washington BOP 1. The equipment addressed includes combination heat and DHW systems, instantaneous water heaters, tank water heaters, and hot water boilers.

1.2. Access

Equipment shall be located to allow easy service access and adequate working space for servicing any component without removal of piping, or other permanently installed fixtures. Service clearances shall comply with the most current edition of the UMC/IMC and NEC. Special care shall be taken in locating components, which require frequent attention.

1.3. Location

Water heaters or boilers addressed under this section shall be located within the conditioned envelope.

1.4. Equipment Efficiency

This section covers the use of space heating and water heating equipment in a hydronic system. The equipment used in the hydronic system may be of combination type or may be separate for either DHW or space heating use. In any case, the minimum equipment efficiencies given in Table 1 shall be met.

1.4.1. Combination Heat and DHW Systems

This equipment is designed to provide both DHW and space heating. Such systems shall be rated using the AHRI Certified Ratings. This rating shall be based on the "Combined Annual Efficiency" (CAef) ratings and "Combined Annual Effective Space Heating Efficiency" as defined by the AHRI Directory of Certified Product Performance.

1.4.2. Combined DHW Equipment (Not Rated for Combined Use)

Systems using all potable water for both heating and DHW shall be rated under the AHRI Certified Ratings. This rating shall be based on the "Energy Factor" (EF) and the Recovery Efficiency.

1.4.3. Separate space heating and DHW equipment

If separate pieces of equipment are being used for space heating and DHW, the domestic hot water system and space heating system shall each be rated under the AHRI Certified Ratings. This rating shall be based on the "Energy Factor" (EF) and the Recovery Efficiency.

1.4.4. Boilers

Boilers installed under this program shall have an “Annual Fuel Utilization Efficiency” (AFUE) rating. Boilers installed shall be provided with an outdoor reset of water temperature.

Table 1: Efficiency Requirements for Water Heating Systems

Path	System Type	Efficiency	Additional Requirement
Path A	Combination Rated System	0.82 CAef	0.82 CAafue
	Space Heating System	0.82 EF	0.82 Recovery Efficiency
	Domestic Water System	0.82 EF	0.82 Recovery Efficiency
	Boiler	82 AFUE	NA
Path B	Combination Rated System	0.90 CAef	0.90 CAafue
	Space Heating System	0.90 EF	0.92 Recovery Efficiency
	Domestic Water System	0.90 EF	0.92 Recovery Efficiency
	Boiler	90 AFUE	NA

1.5. Wall Insulation

1.5.1. Path A: If the equipment options meet the efficiency requirements of Path A, the effective U-value of the wall assembly shall be 0.043. The reference wall construction shall be wall construction with standard framing techniques using R-21 batt insulation and R-5 foam sheathing. Other alternatives could include double wall construction or structural insulated panels and high density foam in-place insulation that achieve this U-value.

1.5.2. Path B: If the equipment options meet the efficiency requirements of Path B, wall insulation installed under this TCO shall follow all requirements of WABOP 1.

1.6. Windows

1.6.1. Path A: If the equipment options meet the efficiency requirements of Path A, the windows installed shall have a U-value of 0.25 or less, NRFC rated.

1.6.2. Path B: If the equipment options meet the efficiency requirements of Path B, windows installed under this program shall follow the requirements of WABOP 1.

1.7. Distribution

1.7.1. Piping

Piping systems distributing hot water for heating shall be insulated to meet the requirements of the local codes. Insulation level shall be consistent with piping designed to

carry 150°F water. In any case, a minimum of 1" of insulation shall be used regardless of local code provisions. This provision shall apply to all supply and return water piping.

1.7.2. Heat Delivery

Heat delivery may be accomplished by fan coil units, wall or ceiling mounted radiators, radiant slab, radiant floor mounted over floor framing or under floor mounted with use of heat transfer fins in contact with sub-flooring.

- Fan coils may be installed as un-ducted zone heaters or ducted air handlers but fan coil control must be provided with a room thermostat. In no case may the fan coil supply or return ducts be installed in unheated or semi-heated zones of the house.
- Radiant slabs and floor surfaces shall be installed in accordance with manufacturer's recommendations. Sub slab insulation shall be R-15 continuous with a thermal break (R-5 minimum) at the slab edge. Thermostatic zone valves or thermostatic control valves shall be installed. Piping designs and manifold and distribution systems shall be submitted to the ENERGY STAR BPS/verifier.
- Radiant floors installed over frame floors shall be insulated to meet the requirements of the WABOP1.
- Individual zone radiators are allowed. Thermostatic valves shall be used to control the individual heating zones.