5.2 Technical Specification: Building Envelope Thermal Retrofits

Small Premium Project Type:

For the retrofit of existing buildings: Projects must improve the thermal performance of an existing building. This may include elements such as: walls, fenestration, floors, and ceilings that enclose a conditioned space. When properly designed, the improvement project will minimize the gain or loss of heat.

Description:

These improvements can include: weatherization, fenestration replacement (and associated weather stripping), adding insulation, duct insulation and installing an energy recovery ventilator (ERV). An owner cannot apply for a Residential Energy Tax Credit for a home that has already received a tax credit for a high performance residential building.

Minimum Operation:

Eligible projects if a rental must be occupied as a conventional residence, or if a business, must be occupied at least 2,000 hours per year.

Equipment Type, Capacity and Performance:

To be eligible for a tax credit, the building envelope system must meet the following requirements within each component category.

Attic Insulation

- 1. Ceilings with existing insulation of R-19 or less must be insulated to a minimum of R-49.
- 2. If a vapor retarder is present, it must be in contact with the surface between attic and conditioned space. New insulation with a vapor retarder must not be installed on top of existing insulation.
- 3. The roof and attic must be free from water leaks and moisture damage prior to performing work. Damaged, poorly installed or systems in need of maintenance or repair do not qualify.
- 4. Sufficient Net Free Area (NFA) of ventilation must be provided or maintained as per code requirements. Eave and soffit vents must be baffled to prevent blockage of air movement. Baffles must be rigid and air impermeable. All baffles must extend at least 4 inches above the final level of insulation. If an attic vent is used as an exhaust duct termination it must not be included in passive attic vent area calculations.
- 5. Exhaust fans vented through the ceiling must be connected to a duct made of appropriate materials (dependent upon nature of ventilation) which is substantially airtight throughout and which terminates directly to the outside in a vent cap. Back-draft dampers are recommended.
- 6. Dams must be installed between insulated and un-insulated areas, such as garages, covered porches and along the upper edge where ceilings differ in height, to keep loose-fill insulation from falling over the edge.
- 7. Thermal insulation must not be installed within 3 inches of fans, lights, heaters and other heat producing fixtures that are not Type-IC rated by UL. Thermal insulation must not be installed so as to entrap heat and prevent the free circulation of air. Solid, flame

resistant baffles attached to the ceiling structure must be used to maintain required clearances.

- a) Only fluorescent fixtures with rated thermal protection must be covered with insulation.
- b) Recessed lighting fixtures and other heat producing fixtures that are Type-IC (Insulation Contact) rated by UL may be covered with insulation.
- c) Non-combustible baffles attached to the ceiling structure must be used to maintain a 3 inch clearance around the perimeter of recessed lighting fixtures and other heat producing fixtures that are not Type-IC rated. Insulation must not be installed directly above recessed lighting fixtures and heat producing combinations that are not Type-IC rated
- d) All combustible insulation materials, including existing insulation, must be kept a minimum of 2 inches from metal flues and masonry chimneys. Non-combustible insulation (per ASTM E-136) may be installed with no clearance around flues and chimneys if permitted by local or state fire code. However, if the flue is a single wall type (i.e. made from a single thickness of rolled sheet metal) then, a 2-inch air clearance to all insulating materials must be maintained.
- 8. If exposed water pipes are located in the attic space, water pipe must be insulated for freeze protection.
- 9. The UL label or equivalent label must appear on every bag of loose fill cellulose material. It must include the file number (R-number) of the manufacturer and the issue number for labels purchased. This ensures adherence to the requirements of CPSC cellulose regulation 16 CFR 1209 (i.e. critical radiant flux, smoldering combustion, settled density and corrosiveness).
- 10. Ceiling accesses must be insulated to at least R-30 with batt-type or rigid insulation and weather-stripped to create an effective air seal.

UNDERFLOOR INSULATION

- 1. Un-insulated floors must be insulated to a minimum of R-30. For construction types in retrofit applications that do not allow enough space for R-30 insulation, R-19 will be allowed as an exception
- 2. The under-floor area must be free from water leaks and moisture damage prior to performing work. Chronic bulk water problems must be fixed with a permanent solution before the floor is insulated. Floors with insulation in need of maintenance or repair do not qualify.
- 3. Insulation must be installed so that there is no air space between the insulation and the subfloor. Compression of insulation is allowed in order to assure or maintain continuous contact with the bottom of the floor. Under-floor insulation support systems must be installed so that the insulation remains in contact with the sub-floor, flat and in place for the life of the house.
 - a. Use one of the following materials to support floor insulation:
 - i. Wood lath—Wood lath must be a minimum of 1/4 x 1 inch for spans up to 48 inches. Spans greater than 48 inch must use at a minimum nominal 1x2 lumber.
 - ii. Twine—Twine must be non-stretching polypropylene or polyester.

- Wire—Wire must be stainless steel, copper or an equivalent material of similar corrosion resistance, with a minimum diameter of 0.040 inch (size 18 AWG). Self-supporting wire hangers are not acceptable.
- b. The maximum spacing for support. The maximum spacing for support systems is as follows:
 - i. 24 inches or less no more than 18 inches apart
 - ii. 48 inches no more than 12 inches apart
 - iii. 60 inches no more than 8 inches apart
 - iv. 72 inches no more than 6 inches apart
- c. Batt-type insulation must be supported no more than 3 inches from the ends. This support must be parallel to the end of the batt. Small pieces of insulation must be supported. Support systems must be fastened to the underside of floor joists.
- 4. Sufficient Net Free Area (NFA) of ventilation must be provided or maintained as per code requirements. If a vent is used as an exhaust duct termination it must not be included in passive attic vent area calculations.
- 5. If a vapor retarder is installed as a part of floor insulation it must have a perm rating of 1.0 or less and must be located between the insulation material and the conditioned space. There must only be one vapor retarder in the assembly and it must be in direct contact with the subfloor and face the conditioned space of the home.
- 6. Exhaust fans vented through the crawlspace must be connected to a duct made of appropriate materials (dependent upon nature of ventilation) which is substantially airtight throughout and which terminates directly to the outside. Back-draft dampers are recommended.
- 7. If exposed water pipes are located in the attic space, water pipe must be insulated for freeze protection.
- 8. Upon completion of the installation of under floor insulation, an acceptable groundcover moisture barrier must be present (new 6 mil black or UV stabilized and opaque polyethylene or existing black 4 mil polyethylene). All joints must be overlapped with sufficient material (12 inch overlap) so that all ground surface area is covered.
- 9. Interior accesses must be insulated to at least R-30 with batt-type or rigid insulation and weather-stripped to create an effective air seal.

WALL INSULATION

- 1. All cavities in all exterior walls must be completely filled and insulated to the highest practical R-value, including small cavities above, below and on the sides of windows and doors. Any damage to interior walls resulting from wall insulation installation must be permanently repaired.
- 2. Insulation may be installed in wall cavities that are 3-1/2 inch deep or greater with 1 inch or less of existing insulation; or less than 3-1/2 inch deep with no existing insulation.
- 3. Insulation must not be installed in wall cavities that serve as air ducts for heating or cooling.
- 4. Insulation material must be installed according to manufacturer specifications.

- 5. The entire stud bay must be filled, including cavities requiring more than one hole due to blocking in the cavity.
- 6. Stud bays containing supply plumbing may be left uninsulated to prevent freezing.
- 7. When access holes for installing the insulation are drilled through the interior wall or finish siding and sheathing, all holes must be plugged and provide a tight weatherproof seal. Plugs must be sealed, weatherproofed and ready to paint. Plugs must not be vented. Plugs must be made of material that will not shrink or expand, which would result in damage to the siding or finish. If the surface of the plug is below the surface of the siding, the hole must be filled with non-shrinking filler. If siding is removed and holes are drilled in the sub-siding, the holes must be plugged.
- 8. The UL label or equivalent label must appear on every bag of loose fill cellulose material. It must include the file number (R-number) of the manufacturer and the issue number for labels purchased. This ensures adherence to the requirements of CPSC cellulose regulation 16 CFR 1209 (i.e. critical radiant flux, smoldering combustion, settled density and corrosiveness).
- 9. Only non-combustible insulation (per ASTM E-136) must be installed in wall cavities adjoining fireplaces and/or chimneys.
- 10. Insulation must not be installed in wall cavities which contain electric space heaters unless fire stops are present which isolate the heater from all contact by the insulation material. Verification must be accomplished by appropriate photographic documentation.

HVAC DUCT INSULATION

- 1. Un-insulated flex-ducts must be replaced with R-8 flex-ducts. Sheet metal/rigid ducts with less than R-2 (not de-rated due to damage) insulation must be insulated to a minimum R-11
- 2. Ducts must be properly supported before insulation is installed. All new and all accessible existing duct joints and metal joints must be mechanically fastened with screws. Flexible ducts must be attached using nylon/plastic straps and tightened with a tool manufactured specifically for tightening nylon/plastic straps around HVAC duct (hand tightening is not acceptable). Stainless steel worm drive clamps are also allowed. Mastic and/or tape must not be used as mechanical fasteners.
- 3. All new and all accessible existing HVAC supply and return ducts, air handlers and plenums outside the conditioned space must be sealed at all joints and corners, including prefabricated joints, with duct mastic meeting UL 181 standards. It is unnecessary to seal longitudinal seams unless they are damaged. Tape is not allowed except for use on operable doors in the system such as on the air handler. In this case, cleaning the joint at an operable door with a suitable solvent and sealing with a UL-181BMX listed tape may be used.
- Ducts located outside of the conditioned space and not protected from the weather, including plenums and boots must be internally insulated.
- 5. All duct insulation should be installed and supported using mechanical fasteners such as permanent plastic straps or nylon twine. Tape may be used on insulation seams to provide a continuous barrier.

6. Ducts must be completely insulated with a material that has a facing with an approved vapor barrier and flame spread rating of 50 for single family and 25 for multi-family or per local code.

PRIME WINDOW and SLIDING GLASS DOOR REPLACEMENTS

- Windows must be installed and supported according to the manufacturer's specifications. Eligible measures include replacement of prime windows with NFRC certified products and replacement of patio doors (French or sliding) with NFRC certified products.
- 2. All windows must meet the egress and safety glazing specifications. If state or local code becomes more restrictive than these specifications, then installers must be required to meet current state or local code.
- 3. Safety glazing must be used where required.
- 4. For an existing building the window area must be the same or smaller than the original.
- 5. Windows must operate smoothly and safely.
- 6. Screens must be furnished with all operable windows.
- 7. Exterior wood, including frame, sash, trim, stops and sills, must be, at a minimum, caulked and primed.
- 8. Hardware and fasteners must be aluminum, stainless steel or other noncorrosive materials.
- 9. Gaps of over 3/8 inch between the exterior siding and the window must be covered with solid trim material. Exterior or interior voids over 3/8 inch in depth or width must be filled with window manufacturer-approved materials, such as backer rod, non-expanding foam or similar product prior to caulking, if caulking will be applied.
- 10. Replacement windows must be certified and labeled for U-factor in accordance with the simulation, testing and certification procedures of the National Fenestration Rating Council Incorporated (NFRC).
- 11. If window weight cavities exist and there is access, the weights must be removed and the cavity must be filled with insulation and sealed.
- 12. Sources of evident water penetration through window openings must be located and corrected. Necessary repairs must be accomplished prior to installation of windows. The bottom rail of a patio door must be firmly supported within 1/2 inch of exterior edge of the frame. Any wood that touches the ground or concrete must be pressure-treated.

Incentive Estimate Worksheet:

The incentive worksheet shown in the following schedule is the prescribed tax credit amounts that small premium projects can receive for thermal improvements to the building envelope. The following worksheet itemizes the components each project will install and the corresponding tax credit amount.

Also, note that Heat or Energy Recovery Ventilators that are approved by the Residential Energy Tax Credit (RETC) program are eligible to receive a SPP tax credit in the same amount, if installed in a commercial building. For a qualifying list of equipment, please see the RETC webpage: <u>http://www.oregon.gov/ENERGY/CONS/RES/tax/HVAC_ERV-HRV.shtml</u>

А	В	С	D	E	F
	Existi	Proposed			
	ng	Insulation	Square	Incentive	
	Insul	R-Value	Feet	Rate	Incentive
	ation				Multiply
	R-			\$/Sq. Ft.	(D x E)
Attic Insulation to R-49				\$0.37	
Floor Insulation to R-30				\$0.55	
Floor Insulation to R-19*				\$0.43*	
Wall Insulation to R-13**				\$0.40**	
Wall Insulation to R-21				\$0.50	
Windows (Double pane) U30 or lower***				\$1.63***	
Windows (Double pane) U25 or lower***				\$2.71***	
Windows (Single pane) U30 or lower				\$7.50	
Windows (Single pane) U25 or lower				\$7.92	
			Lineal		
			Feet	\$/Ln. Ft.	
Duct Insulation to R-11				\$1.50	
			Net Air		
	Manufact	Model #	Flow	Tax Credit From RETC List	
Energy Recovery Ventilation					
Total					
Incentive					

* - Only permitted where space limitation will not accommodate R-30.

** - Only permitted where space limitation will not accommodate R-21

*** - Includes single pane with storm or any window configuration other than single pane.