# THE CITY OF FIRCREST

## 2015 RESIDENTIAL ENERGY CODE PRESCRIPTIVE COMPLIANCE FORM

(Please submit 2 copies)

115 Ramsdell Street Fircrest, WA 98466 Phone: (253) 564-8902 ● Website: www.cityoffircrest.net

For more information about the energy code, visit: http://www.energy.wsu.edu/BuildingEfficiency/EnergyCode.aspx

Project Address: _____

**This project will use the requirements of the Prescriptive Path below and incorporate the minimum values listed. In addition, based on the size of the structure, the appropriate number of additional credits are checked as chosen by the permit applicant.**

Authorized Representative _____ Date _____

| All Climate Zones | | |
|---|---|---|
| | R-Value[a] | U-Factor[a] |
| Fenestration U-Factor[b] | n/a | 0.30 |
| Skylight U-Factor | n/a | 0.50 |
| Glazed Fenestration SHGC[b,e] | n/a | n/a |
| Ceiling[k] | 49[j] | 0.026 |
| Wood Frame Wall[g,m,n] | 21 int | 0.056 |
| Mass Wall R-Value[i] | 21/21[h] | 0.056 |
| Floor | 30[g] | 0.029 |
| Below Grade Wall[c,m] | 10/15/21 int + TB | 0.042 |
| Slab[d] R-Value & Depth | 10, 2 ft | n/a |

*Table R402.1.1 and Table R402.1.3 Footnotes included on Page 2.

**Each dwelling unit in a residential building shall comply with sufficient options from Table R406.2 so as to achieve the following minimum number of credits:**

- ◉ **1. Small Dwelling Unit: 1.5 credits**
  Dwelling units less than 1500 square feet in conditioned floor area with less than 300 square feet of fenestration area. Additions to existing building that are greater than 500 square feet of heated floor area but less than 1500 square feet.
- ○ **2. Medium Dwelling Unit: 3.5 credits**
  All dwelling units that are not included in #1 or #3. **Exception:** Dwelling units serving R-2 occupancies shall require 2.5 credits.
- ○ **3. Large Dwelling Unit: 4.5 credits**
  Dwelling units exceeding 5000 square feet of conditioned floor area.
- ○ **4. Additions less than 500 square feet: .5 credits**

## Whole House Ventilation (Prescriptive)

**Please check the appropriate box to describe which of the four prescriptive Whole House Ventilation Systems you will be using AND fill in the required whole house ventilation rate in CFM's.** (See "2015 Residential Whole House Ventilation Rate" Handout.)

| | WHOLE HOUSE VENTILATION METHOD | Whole House Ventilation Rate |
|---|---|---|
| ○ | Intermittent Whole House Ventilation Using Exhaust Fans & Fresh Air Inlets. (IRC M1507.3.4) | |
| ○ | Intermittent Whole House Ventilation Integrated with a Forced Air System. (IRC M1507.3.5) | |
| ○ | Intermittent Whole House Ventilation using a Supply Fan. (IRC M1507.3.6) | |
| ○ | Intermittent Whole House Ventilation Using a Heat Recovery Ventilation System (IRC M1507.3.7) | |

**Table R402.1.1 Footnotes**

For SI: 1 foot .= 304.8 mm, ci .= continuous insulation, int .= intermediate framing.

[a] R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the compressed R-value of the insulation from Appendix Table A101.4 shall not be less than the R-value specified in the table.

[b] The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

[c] "10/15/21.+TB" means R-10 continuous insulation on the exterior of the wall, or R-15 on the continuous insulation on the interior of the wall, or R-21 cavity insulation plus a thermal break between the slab and the basement wall at the interior of the basement wall. "10/15/21.+TB" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the wall. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall. "TB" means thermal break between floor slab and basement wall.

[d] R-10 continuous insulation is required under heated slab on grade floors. See R402.2.9.1.

[e] There are no SHGC requirements in the Marine Zone.

[f] Reserved.

[g] Reserved.

[h] Reserved.

[i] The second R-value applies when more than half the insulation is on the interior of the mass wall.

[j] Reserved.

[k] For single rafter- or joist-vaulted ceilings, the insulation may be reduced to R-38.

[l] Reserved.

[m] Int. (intermediate framing) denotes standard framing 16 inches on center with headers insulated with a minimum of R-10 insulation.

**Table R402.1.3 Footnote**

[a] Nonfenestration U-factors shall be obtained from measurement, calculation or an approved source or as specified in Section R402.1.3.

## 2015 WSCE – Table R406.2 – Mark the options that you will be using for this project

| OPTION | DESCRIPTION | CREDIT(S) |
|---|---|---|
| ☐ 1a | **EFFICIENT BUILDING ENVELOPE 1a:**<br>Vertical fenestration U = 0.28<br>Floor R-38<br>Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab.<br>**OR** Compliance based on Section R402.1.4: Reduce the Total UA by 5%. | 0.5 |
| ☐ 1b | **EFFICIENT BUILDING ENVELOPE 1b:**<br>Vertical fenestration U = 0.25<br>Wall R-21 plus R-4 Floor R-38<br>Basement wall R-21 int plus R-5 ci<br>Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab.<br>**OR** Compliance based on Section R402.1.4: Reduce the Total UA by 15%. | 1.0 |
| ☐ 1c | **EFFICIENT BUILDING ENVELOPE 1c:**<br>Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.22<br>Ceiling and single-rafter or joist-vaulted R-49 advanced Wood frame wall R-21 int plus R-12 ci<br>Floor R-38<br>Basement wall R-21 int plus R-12 ci<br>Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab<br>**OR** Compliance based on Section R402.1.4: Reduce the Total UA by 30%. | 2.0 |
| ☐ 1d | **EFFICIENT BUILDING ENVELOPE 1d:**<br>Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.24. Projects using this option may not use Option 1a, 1b or 1c. | 0.5 |
| ☐ 2a | **AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2a:**<br>Compliance based on R402.4.1.2: Reduce the tested air leakage to 3.0 air changes per hour maximum<br>**AND** All whole house ventilation requirements as determined by Section M1507.3 of the *International Residential Code* shall be met with a high efficiency fan (maximum 0.35 watts/cfm), not interlocked with the furnace fan. Ventilation systems using a furnace including an ECM motor are allowed, provided that they are controlled to operate at low speed in ventilation only mode.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the qualifying ventilation system.*** | 0.5 |
| ☐ 2b | **AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2b:**<br>Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 2.0 air changes per hour maximum<br>**AND** All whole house ventilation requirements as determined by Section M1507.3 of the *International Residential Code* shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.70.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.*** | 1.0 |
| ☐ 2c | **AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2c:**<br>Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 1.5 air changes per hour maximum.<br>**AND** All whole house ventilation requirements as determined by Section M1507.3 of the *International Residential Code* shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.85.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.*** | 1.5 |
| ☐ 3a | **HIGH EFFICIENCY HVAC EQUIPMENT 3a:**<br>Gas, propane or oil-fired furnace with minimum AFUE of 94%, or Gas, propane or oiled-fired boiler with minimum AFUE of 92%. Projects may only include credit from one space heating option, 3a, 3b, 3c or 3d. When a housing unit has two pieces of equipment (i.e., two furnaces) both must meet the standard to receive the credit.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.*** | 1.0 |
| ☐ 3b | **HIGH EFFICIENCY HVAC EQUIPMENT 3b:**<br>Air-source heat pump with minimum HSPF of 9.0. Projects may only include credit from one space heating option, 3a, 3b, 3c or 3d. When a housing unit has two pieces of equipment (i.e., two furnaces) both must meet the standard to receive the credit.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.*** | 1.0 |
| ☐ 3c | **HIGH EFFICIENCY HVAC EQUIPMENT 3c:**<br>Closed-loop ground source heat pump; with a minimum COP of 3.3<br>**OR** Open loop water source heat pump with a maximum pumping hydraulic head of 150 feet and minimum COP of 3.6. Projects may only include credit from one space heating option, 3a, 3b, 3c or 3d. When a housing unit has two pieces of equipment (i.e., two furnaces) both must meet the standard to receive the credit.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.*** | 1.5 |
| ☐ 3d | **HIGH EFFICIENCY HVAC EQUIPMENT 3d:**<br>Ductless Split System Heat Pumps, Zonal Control: In homes where the primary space heating system is zonal electric heating, a ductless heat pump system shall be installed and provide heating to the largest zone of the housing unit. Projects may only include credit from one space heating option, 3a, 3b, 3c or 3d. When a housing unit has two pieces of equipment (i.e., two furnaces) both must meet the standard to receive the credit.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.*** | 1.0 |

## 2015 WSCE – Table R406.2 - Continued

| OPTION | DESCRIPTION | CREDIT(S) |
|---|---|---|
| ☐ 4 | **HIGH EFFICIENCY HVAC DISTRIBUTION SYSTEM:**<br>All heating and cooling system components installed inside the conditioned space. This includes all equipment and distribution system components such as forced air ducts, hydronic piping, hydronic floor heating loop, convectors and radiators. All combustion equipment shall be direct vent or sealed combustion.<br>For forced air ducts: A maximum of 10 linear feet of return ducts and 5 linear feet of supply ducts may be located outside the conditioned space. All metallic ducts located outside the conditioned space must have both transverse and longitudinal joints sealed with mastic. If flex ducts are used, they cannot contain splices. Flex duct connections must be made with nylon straps and installed using a plastic strapping tensioning tool. Ducts located outside the conditioned space must be insulated to a minimum of R-8. Locating system components in conditioned crawl spaces is not permitted under this option. Electric resistance heat and ductless heat pumps are not permitted under this option. Direct combustion heating equipment with AFUE less than 80% is not permitted under this option.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and shall show the location of the heating and cooling equipment and all the ductwork.*** | 1.0 |
| ☐ 5a | **EFFICIENT WATER HEATING 5a:**<br>All showerhead and kitchen sink faucets installed in the house shall be rated at 1.75 GPM or less. All other lavatory faucets shall be rated at 1.0 GPM or less.<br>Plumbing Fixtures Flow Ratings. Low flow plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with the following requirements:<br>1. Residential bathroom lavatory sink faucets: Maximum flow rate - 3.8 L/min (1.0 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.<br>2. Residential kitchen faucets: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.<br>3. Residential showerheads: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum flow rates for all showerheads, kitchen sink faucets, and other lavatory faucets.*** | 0.5 |
| ☐ 5b | **EFFICIENT WATER HEATING 5b:**<br>Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.74<br>**OR** Water heater heated by ground source heat pump meeting the requirements of Option 3c.<br>**OR** For R-2 occupancy, a central heat pump water heater with an EF greater than 2.0 that would supply DHW to all the units through a ce minimum pipe insulation.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency.*** | 1.0 |
| ☐ 5c | **EFFICIENT WATER HEATING 5c:**<br>Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.91<br>**OR** Solar water heating supplementing a minimum standard water heater. Solar water heating will provide a rated minimum savings of 85 therms or 2000 kWh based on the Solar Rating and Certification Corporation (SRCC) Annual Performance of OG-300 Certified Solar Water Heating Systems<br>**OR** Electric heat pump water heater with a minimum EF of 2.0 and meeting the standards of NEEA's Northern Climate Specifications for Heat Pump Water Heaters<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency and, for solar water heating systems, the calculation of the minimum energy savings.*** | 1.5 |
| ☐ 5d | EFFICIENT WATER HEATING 5d:<br>A drain water heat recovery unit(s) shall be installed, which captures waste water heat from all the showers, and has a minimum efficiency of 40% if installed for equal flow or a minimum efficiency of 52% if installed for unequal flow. Such units shall be rated in accordance CSA B55.1 and be so labeled.<br>***To qualify to claim this credit, the building permit drawings shall include a plumbing diagram that specified the drain water heat recovery units and the plumbing layout needed to install it and labels or other documentation shall be provided that demonstrates that the unit complies with the standard.*** | 0.5 |
| ☐ 6 | **RENEWABLE ELECTRIC ENERGY:**<br>For each 1200 kWh of electrical generation per each housing unit provided annually by on-site wind or solar equipment a 0.5 credit shall be allowed, up to 3 credits. Generation shall be calculated as follows:<br>For solar electric systems, the design shall be demonstrated to meet this requirement using the National Renewable Energy Laboratory calculator PVWATTs. ***Documentation noting solar access shall be included on the plans.***<br>For wind generation projects designs shall document annual power generation based on the following factors:<br>The wind turbine power curve; average annual wind speed at the site; frequency distribution of the wind speed at the site and height of the tower.<br>***To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the photovoltaic or wind turbine equipment type, provide documentation of solar and wind access, and include a calculation of the minimum annual energy power production.*** | 0.5 |

Energy Code Support

WASHINGTON STATE UNIVERSITY EXTENSION ENERGY PROGRAM

# Insulation Certificate for Residential New Construction

Permit #: _____

House address or lot number: _____

## Walls

Type of insulation: _____

Manufacturer: _____

R-Value: _____

## Floor

Type of insulation: _____

Manufacturer: _____

R-Value: _____

## Flat Ceiling/Attic

Type of insulation: _____

Manufacturer: _____

R-Value: _____

## Single Rafter Joist Vaulted Ceiling

Type of insulation: _____

Manufacturer: _____

R-Value: _____

## Blown or Sprayed Fiberglass or Cellulose - Walls

R-Value per Inch: _____

Coverage Area: _____

Bag Count: _____

## Blown or Sprayed Fiberglass or Cellulose - Ceiling

R-Value per Inch: _____

Coverage Area: _____

Bag Count: _____

## Sprayed Polyurethane Foam (SPF)

Density:_____

Installed Thickness:_____

R-Value of Installed Thickness_____

Building Component Installed: walls floor ceiling

## Insulation Installer:

Company Name: _____ Installer: _____

Installer Signature: _____ Date: _____

Phone Number: _____

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**Washington State Energy Code Reference** http://www.energy.wsu.edu/Documents/2012%20Res%20Energy.pdf **:**

**R303.1 Identification.** Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code.

**R303.1.1 Building thermal envelope insulation.** An R-value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and R-value of insulation installed in each element of the building thermal envelope. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled R-value, installed density, coverage area and number of bags installed shall be listed on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and R-value of installed thickness shall be listed on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

# Building Air Leakage Testing

2012 Washington State Energy Code (WSEC) section R402.4.1.2 requires air leakage testing for all new houses and additions. The requirement is met if the structure has a leakage rate of 5 air changes per hour when depressurized with a blower door to 50 Pascals or less ($5ACH_{50}$). A Pascal is a measurement of pressure. 249 Pascals are equal to 1" of water column. The test must be performed using a Blower Door device which consists of a large fan, a frame and panel. A manometer (pressure gauge) is used to read house and fan pressures.

WSEC states that the test may be performed at any time after rough in. All penetrations in the building envelope must be sealed including those for utilities, plumbing, electrical, ventilation and combustion appliances. The code also states that when required by the building official, the test shall be conducted by an approved third party.

To conduct the test:

1. Close all windows, doors and fireplace and stove doors.
2. Close all dampers including exhaust, intake, make-up air, backdraft and flue dampers. Since you will be depressurizing the house, dampers in bath fans, etc. will be sucked closed during the test and will therefore not negatively affect the results.
3. Make sure plumbing traps are filled with water.
4. Leave doors between heated areas open.
5. Open access hatches to conditioned attics and/or conditioned crawl spaces. Leave hatches closed if these are unconditioned areas.
6. Seal exterior openings for continuously operating ventilation systems and heat recovery ventilators.
7. Turn off heating and cooling systems but do not seal supply or return registers.
8. Adjust all combustion appliances so that they do not turn on during the test.
9. Install the blower door in an exterior door opening and connect hoses from the manometer to the blower door fan and the exterior pressure tap. See manufacturer's instructions for correct set-up.
10. Depressurize the house to -50 Pascals.

11. Record the flow rate (with simple manometers, the fan pressure (Pa) is converted to $CFM_{50}$ using a flow table. Many digital manometers sold with blower doors can automatically perform this conversion, and display $CFM_{50}$ directly.) Consult your blower door and manometer manuals.

You now must convert the flow rate ($CFM_{50}$) to $ACH_{50}$. Use the following formula:

$$ACH_{50} = (CFM50 \times 60) / Volume$$

Where: $ACH_{50}$ = Air Changes per Hour at -50 Pascals
CFM50 X 60 = Converts Cubic Feet per Minute to Cubic Feet per Hour
Volume = Conditioned floor area of the housing unit multiplied by the ceiling height

Example: A blower door test has been done on a 2,000 square foot house and the fan flow (CFM50) rate is 1100 CFM.

$$ACH_{50} = (CFM50 \times 60) / Volume$$

$$ACH_{50} = (1100 \times 60) / (2000 \times 8)$$

$$ACH_{50} = 66{,}000/16{,}000$$

$$\mathbf{ACH_{50} = 4.1}$$

Since the code requires the $ACH_{50}$ to be less than 5, this house complies with an $ACH_{50}$ of 4.1. Record the $ACH_{50}$ on the energy certificate on or near the electrical panel.

Energy Code Support

WASHINGTON STATE UNIVERSITY EXTENSION ENERGY PROGRAM

# Duct Leakage Affidavit (New Construction)

Permit #: _____

House address or lot number: _____

City: _____ Zip: _____

Cond. Floor Area ($ft^2$): _____ Source (circle one): Plans Estimated Measured

☐ Duct tightness testing is not required. The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope. Ducts located in crawl spaces do not qualify for this exception.

Air Handler in conditioned space? ☐ yes ☐ no Air Handler present during test? ☐ yes ☐ no

Circle Test Method: Leakage to Outside Total Leakage

***Maximum duct leakage:***

**Post Construction, total duct leakage:** (floor area x .04) = _____CFM@25 Pa

**Post Construction, leakage to outdoors:** (floor area x .04) = _____CFM@25 Pa

**Rough-In, total duct leakage with air handler installed:** (floor area x .04) = _____CFM@25 Pa

**Rough-In, total duct leakage with air handler not installed:** (floor area x .03) = _____CFM@25 Pa

**Test Result:** _____CFM@25Pa

Ring (circle one if applicable): Open 1 2 3

Duct Tester Location: _____ Pressure Tap Location: _____

**I certify that these duct leakage rates are accurate and determined using standard duct testing protocol.**

Company Name: _____ Technician: _____

Technician Signature: _____

Date: _____

Phone Number: _____

## Washington State Energy Code Requirements


Did you know that testing ductwork in your house is now required by the Washington State Energy Code (WSEC) if you are repairing or replacing certain parts of your heating or cooling (HVAC) system?

Your HVAC contractor must test the ducts in your home and provide the results to you and the building official that issued your permit. Once you have the results, you can choose whether or not you want the contractor to seal your ducts.

Some houses are exempt from these requirements. If your house has any of the following, you do not have to test your ducts:

- All of the ductwork is contained inside your house or less than 40 linear feet is outside of the conditioned space.
- The ducts have been previously tested and sealed.
- The ducts contain asbestos.

## More information

For more facts about duct sealing, you can watch the video "*Duct Sealing for Comfort, Energy and Indoor Air Quality.*"


This video can be found on our website:
*www.energy.wsu.edu/code*

**Washington State University**
**Extension Energy Program**
905 Plum St. SE, Bldg. 3
P.O. Box 43165
Olympia, WA 98504-3165

Phone: (360) 956-2000
Fax: (360) 956-2217

Email:
*energycode@energy.wsu.edu*

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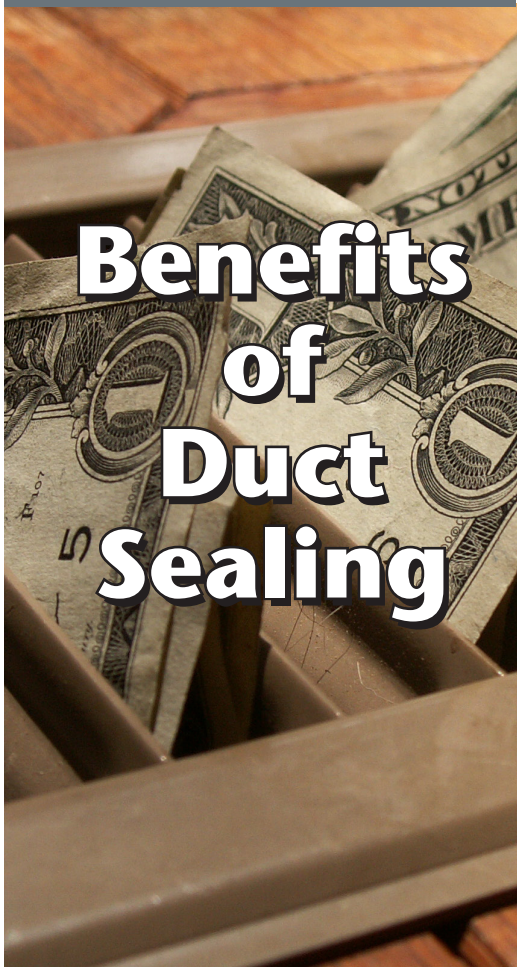
WASHINGTON STATE UNIVERSITY
EXTENSION ENERGY PROGRAM



# Benefits of Duct Sealing

Prepared in cooperation with

neea

U.S. DEPARTMENT OF ENERGY

# Why should you seal your ducts?

Sealing the ducts in your home is an easy decision that can help you reap several benefits.

## Energy Savings

Duct sealing can help you save on your monthly heating and cooling bills, resulting in more money in your pocket. Leaky duct systems typically contribute to 20-40 percent of a home's heating and cooling costs. Duct sealing can increase a heating and/or cooling system's efficiency to a greater degree than upgrading to a high-efficiency furnace and with less of an investment.

Additionally, if you plan to install a new heating and cooling system, having efficient ducts may make it possible for you to downsize to a smaller, less costly system.

## Improved Comfort

If you find that some rooms in your home get too warm while others stay too cool – or if you experience uncomfortable drafts – it might be due to leaks in your duct system. Sealing ducts can help keep the temperature even.

## Cleaner Air

Sealing your ducts can also improve the air quality inside your home and safeguard the health of your family. Leaky ducts can cause the air in your home to carry pollutants like car exhaust, pesticides, insulation fibers, mold or mildew, and more. Duct leaks can also draw in combustion gases from fireplaces, wood stoves, gas and oil furnaces, and water heaters.

## Help the Environment

When you seal the ducts in your home, it reduces the amount of energy your home uses. The less energy we use, the less pollution we create. If we all do our part to conserve energy, we will have a cleaner, healthier environment.

# Cost vs. Savings

The cost of sealing your ducts will vary based on the market and the going rate of labor where you live. The type of existing ductwork system that you have in your house will also impact the cost of duct sealing.

Evaluating the payback is impacted by many variables such as: the climate where you live, where your ductwork is located, how frequently your heating and air conditioning equipment is running, and the cost of energy from your local utility.

In general, research proves that duct sealing has a quick payback and is one of the most effective energy saving measures you can perform on your home.

- National Renewable Energy Laboratory and U.S. Department of Energy (DOE) research concludes that the cost of sealing and/or insulating ductwork can often be paid for in three years from energy savings alone.
- According to a study by DOE's Energy Information Administration, duct sealing yields the greatest energy savings out of 12 measures studied – and it was the least expensive.
- Research by Lawrence Berkeley National Laboratory concludes that 25 percent of the energy typically used – and money spent – for heating and cooling is wasted through duct system energy losses in forced air distribution systems.

WASHINGTON STATE UNIVERSITY
ENERGY PROGRAM

www.energy.wsu.edu

# Getting to Know Your Ventilation Systems

## *Exhaust Type- Whole House*

**Our Mission**
To advance environmental and economic well-being by providing unmatched energy services, products, education and information based on world-class research.

**About Us**
Our staff of nearly 100 people (energy engineers, energy specialists, technical experts, software developers, energy research librarians, and more) work out of our Olympia, Spokane and satellite offices. Operating similar to a consulting firm, the WSU Energy Program is a self-supported department within the University.

**Within WSU**
We are part of the College of Agricultural, Human and Natural Resource Sciences. We report directly to the WSU Vice President of Agriculture and Extension.

**Contact**
Gary Nordeen
Senior Building Science Specialist
360-956-2040
*NordeenG@energy.wsu.edu*
*www.energy.wsu.edu*

Your new home was designed and built to meet the requirements of the 2012 Washington State Codes. The Code specifications help your home use energy efficiently and will contribute to the maintenance of a healthy indoor environment.

The ventilation systems in your new home contribute to maintaining that healthy environment by exhausting pollutants, excess moisture, odors, chemical by-products and other contaminants, and replacing stale air with outside air.

As a homeowner, you are responsible for making sure your ventilation systems will do their job. These instructions will teach you how to operate and maintain your ventilation systems.

The key components of your ventilation systems are the local exhaust fans, the whole house fan, and timers or other controls.

### Local Exhaust Fans

Local exhaust fans, like the bath fan shown here, remove moisture, odors or other pollutants that are produced in kitchens, bathrooms, and laundry rooms.

If you are tempted not to use these fans because you think they are unnecessary, or too noisy, think again:

- Removing moisture and pollutants at their source is far more effective than allowing them to dissipate over time.
- Controlling moisture reduces the cause of many molds and protects the finishes of your home.
- Controlling odors and chemical by-products reduces health hazards that may be associated with these substances.

It is particularly important to operate your kitchen fan if you have a gas or propane range. In addition to removing moisture and odors created by cooking, your kitchen exhaust fan removes the unhealthy by-products of combustion, including carbon monoxide and nitrogen oxides.

***Operating your local exhaust fan***

1. **Turn the fan on** whenever moisture, odors, household chemicals or combustion by-products are present in the room, such as during showering, washing clothes or cooking.
2. **Run the fan for a minimum of 15 minutes** and up to 60 minutes after you have completed the activity that produced the moisture, odors or combustion by-products because they tend to linger.

## Whole House Fan

Your home has undergone a detailed air sealing regimen, with the goal of keeping outside air outside and conditioned air inside, saving you money on heating and cooling. Because your house is well sealed, outside air cannot easily enter your home through uncontrolled drafts. A whole house fan is needed to control the intake of air into your home to replace the stale air that has accumulated.

***Let your whole house fan run 24/7***

Your whole house fan was designed to bring in a certain volume of outside air (measured in cubic feet per minute) to meet stringent requirements for air flow and sound control. It is equipped with a control, which can be a standard ON/OFF switch or a programmable timer. It is recommended that you operate the fan 24 hours a day.


Your whole house fan capacity was selected based on the size of the house, the number of bedrooms. The table below shows required continuous ventilation rates (in CFM) for homes of various sizes.

In many cases, a bathroom fan may do double-duty as the local exhaust *and* the whole house fan. These fans may have a control that sets the continuous operation ventilation rate (in CFM) and a sensor that ramps the fan up to a higher CFM when the room is occupied. This sensor can be set to run the fan for a specific period of time after the occupant leaves the room before it ramps down to the lower CFM rate.

***Cost of Operation***

You may be concerned about the energy costs to operate the whole house fan and the loss of heat when air is exhausted 24/7. A house with a standard gas furnace (80% efficient) using an exhaust fan for continuous ventilation will cost about $120 per year.

While this cost is not insignificant, it is important to remember that your ventilation system is designed to ensure the best possible indoor air quality. Without this system, you may develop problems caused by moisture or air pollutants, leading to potential health and safety issues.

For more information on the Washington State Energy Code or ventilation requirements, visit: www.energy.wsu.edu/code

**Required Ventilation Rates (in CFM) Based on House Size**

| House Size ($ft^2$) | Bedrooms | | | | |
|---|---|---|---|---|---|
| | 0-1 | 2-3 | 4-5 | 6-7 | >7 |
| <1,500 | 30 | 45 | 60 | 75 | 90 |
| 1,501-3,000 | 45 | 60 | 75 | 90 | 105 |
| 3,001-4,500 | 60 | 75 | 90 | 105 | 120 |
| 4,501-6,000 | 75 | 90 | 105 | 120 | 135 |
| 6,001-7,500 | 90 | 105 | 120 | 135 | 150 |
| >7,500 | 105 | 120 | 135 | 150 | 165 |

# Certificate

A permanent certificate shall be posted within three feet of the electrical distribution panel. The certificate shall be completed by the builder or registered design professional and include all of the information as follows:

**2012 WSEC Residential Energy Compliance Certificate**

**Property Address:** _____

**Conditioned Floor Area:** _____ **Date:** ___/___/___

**Builder or registered design professional :**

_____

***Signature:*** _____

***R-Values***

| | | | | | |
|---|---|---|---|---|---|
| **Ceiling:** | Vaulted | R-_____ | **Floors:** | Over unconditioned space | R-_____ |
| | Attic | R-_____ | | Slab on grade floor | R-_____ |
| **Walls:** | Above grade | R-_____ | **Doors:** | _____ | R-_____ |
| | Below, int. | R-_____ | | _____ | R-_____ |
| | Below, ext. | R-_____ | | _____ | R-_____ |

***U-Factors and SHGC***

| | | | |
|---|---|---|---|
| NFRC rating (or) | Windows | U-_____ | SHGC- N/A |
| Default rating (Appendix A WSEC 2012) | Skylights | U-_____ | SHGC- N/A |

***Table 406.2 Option(s)*** _____ ***Total 406.2 Credits*** _____

***Heating, Cooling & Domestic Hot Water***

| System | Type | Efficiency |
|---|---|---|
| Heating | | |
| Cooling | | |
| DHW | | |

***Duct & Building Air Leakage***

All ducts & HVAC in conditioned space ( yes / no ) Insulation R-_____

Air handler present ( yes / no )

Test Target _____ CFM@25Pa Test Result _____ CFM@25Pa

Building air leakage target: $ACH_{50} < 5.0$ - Tested leakage: $ACH_{50}$ = _____

***Onsite Renewable Energy Electric Power System***

System type: _____ Rated annual generation _____ **Kwh**