


Bellevue	Bothell	Burien	Issaquah	Kenmore	Kirkland
 MyBuildingPermit.com <small>a service of eCityGov.net</small>			INSPECTION CHECKLIST Residential Mechanical Final April 2011		
Mercer Island	Mill Creek	Sammamish	Snohomish County	Snoqualmie	Woodinville

2009 Codes

This checklist is intended for use to prepare for an inspection. This is only a general list and does not represent the full body of the 2009 International Residential Code (R = Residential, M = Mechanical, G = Gas), 2009 Uniform Plumbing Code (UPC), the 2009 Washington State Energy Code (WSEC).

Please verify the following before calling for a mechanical final inspection. It is important that you reference the appropriate rough in checklist for code application questions or the jurisdiction that issued the permit and will be conducting the inspection.

Permits and Plans

- Job address is posted in a visible location. (R319.1)
- Permit and approved plans, and mechanical construction documents are on site and accessible to the inspector. (R105.3, M1302.2)
- Permit information is correct (address, permit number, scope of work, etc).
- Prior required mechanical rough-in inspections are approved. (R109.1.2)
- The test report required by the 2009 WSEC be on site. (WSEC 101.3.2.6 / M1302.3)

Garage

- Source of ignition on gas appliances (water heaters, furnaces, & electronic air cleaners) must be a minimum of 18" above the floor unless listed as flammable vapor ignition resistant (FVIR). (M1307.3, G2408.2)
- Exposed ducts to be a minimum of 26 gauge sheet metal with no openings into garage. (R303.5.2)
- All ducts in attic, garage, crawl space, or other unconditioned spaces, insulated with minimum R-8 . (WSEC Table 5-11)
- Bollard or wheel stop required if equipment is subject to mechanical damage. (M1307.3.1)

Gas Piping

- Drip legs installed at each appliance or where condensation could collect. (G2419.2)
- Sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical. (Except for illuminating appliances, ranges, clothes dryers, and outdoor grills). (G2419.2, G2419.4)
- Unions or flex connectors are installed between shut-off valve and appliance. (G2422.1.4)
- Unions or flex connectors cannot be concealed within or extend through a wall, floor, partition or appliance housing. (G2422.1.2.3)
- One flex connector up to 6' long is allowed on each appliance. (G2422.1.2.1)
- A shut-off valve is required in for each appliance, upstream of union and accessible. (G2420.5)
- Steel Pipe Support: (Table G2424.1)
 - $\frac{1}{2}$ " pipe supported every 6ft.
 - $\frac{3}{4}$ " – 1" support every 8ft.
 - 1 $\frac{1}{4}$ " or larger support every 10ft.
 - 1 $\frac{1}{4}$ " or larger (vertical) support at every floor level.
- Piping cannot be installed in or through a ducted supply, return, supply or exhaust, or clothes chute, chimney or gas vent, ventilating duct, dumbwaiter or elevator shaft. Piping installed downstream of the point of delivery shall not extend through any townhouse unit other than the unit served by such piping. G2415.1 (404.1)

- Vent piping for relief vents and breather vents must be vented directly, and independently to the outdoors. Vent piping for breather vents only can be manifolded according to regulator manufacturer installation instructions. The vent must be designed to prevent the entry of insects, water and foreign objects. (G2421.3, and 3.1.)

Appliance Vents:

- Gravity venting system of equivalent area to the vent collar on the appliance. Performance standards can reduce the vent size. (G2428.2.2)
- Single wall vents or B vents connecting to flue collars or draft hoods can be screwed or riveted for securement as recommended by the manufacturer. (M2427.10.7)
- Vents connected to common vent system within the same story require inlets to be at the highest level consistent with headroom and clearance to combustibles. Vent system area cannot be less than the area of the largest vent plus 50% of the smaller flue collar added. (M1801.11, G2427.10.3.4)
- Offsets in gravity vents installed with as many offsets as required that do not exceed 45 degrees from vertical, except no more than one of 60 degrees is allowed and horizontal runs don't exceed 75% of the vertical height of the venting system. (G2427.6.8.2)
- Vent connectors serving Category 1 appliances are not connected to any portion of a mechanical draft system operating under positive pressure. (G2427.10.4)
- Gas vents less than 12" in diameter in roofs with pitches less than or equal to 6/12 can terminate a minimum of 12" above the roof as long as such vents are at least 8' from a vertical wall or similar obstruction. See Figure G2427.6.5 for distances from vertical objects including roof pitch. (G2427.6.3)
- Vent clearances to combustibles per manufacturer's listing or performance standards. (M1803.3.4, M1306.2, G2427.7.7)
- Single wall vents cannot penetrate a wall, floor or ceiling without a thimble and piping limited to the space the equipment is located to the roof or exterior wall. (M1803.3.1, G2427.7.7)
- Vent terminations installed per the manufacturer's listing. (M1804.2.1)
- Mechanical draft venting systems shall be installed in accordance with their listing, and: terminate not less than 4' below or 4' horizontally from, and not less than 1' above a door, an operable window or a gravity air inlet into a building, nor within 10' of a forced air intake nor within 12" above grade. (M1804.2.6)
- Where vents extending into an attic pass through insulated assemblies, an insulation shield of 26 gage sleeve not less than 2 inches above the insulation to be secured in place and maintain required clearances to combustibles. (G2426.4)
- Direct vent terminations. See manufacturer's installation instructions (M1804.2.5)
- Vent connector clearance to combustibles installed per Table G2427.10.5.
- Single wall connectors cannot originate in an attic or concealed space or pass through an attic, inside a wall or concealed space. (G2427.7.6)
- When a vent connector of a gas appliance with a draft hood is located within or passes through a cold area, that portion of the connector is a type B or type L vent. (G2427.10.2.2) Installer will have to provide the ASHRAE standards for the exception.
- B vent chimneys supported above the roof per manufacturer's requirements. (G2427.6.9)
- Type B or L vents terminate at least 5' in vertical height above the highest connected equipment draft hood or flue collar. (G2427.6.4)
- Plastic vent joints require primer of a contrasting color per appliance manufacturer's installation instructions. (G2427.4.1.1)

Gas Water Heaters

- See the Water Heater Tip Sheet 7 for additional information.
- If a gas water heater has been installed it is a mechanical inspection but may include plumbing if piping was moved. If an electric water heater is installed, it is a plumbing inspection and will be covered on the Residential Plumbing Final Checklist.
- Temperature and pressure relief valve required on water heaters (UPC 506.2). The drain from the relief valve must be able to drain by gravity. (UPC 608.5)
- The pipe for the drain to be hard and full sized, no flex connectors or pex piping. (UPC 608.5)

- The drain terminates outside the building 6" - 24" above grade and has a soldered/glued (copper/plastic) on elbow as needed to direct the flow toward the ground or terminates at an approved drain. It may not be directly connected to a sanitary sewer. (UPC 608.5 as amended by WA State)
- Water heaters located in a garage to be raised so that the source of ignition is at least 18" above the floor unless listed as flammable vapor ignition resistant (FVIR). M1307.3 & UPC 508.14)
- Seismic strapping will be installed per Water Heater Tip Sheet 7. Two straps, 1 in lower 1/3 and 1 in upper 1/3 and 3/4" wide. Straps to be 22 gauge metal with each end of strap lag bolted onto two different studs. Lower point strapping at 4" minimum distance above the controls. (M1307.2 & UPC 508.2)
A water heater when installed in the normal path of a vehicle requires protection. (M1307.3.1, G2408.3)
- Water heaters in attics, attic-ceiling assembly, floor-ceiling assembly, or floor/subfloor assembly where damage may result from a leaking water heater, a watertight pan of corrosion resistant material is installed with a 3/4" drain that is piped to an approved location. (UPC 508.4)
- Any water system provided with a check valve, backflow prevention or a pressure regulating device which does not have a bypass feature at its source is provided with an approved, listed, adequately sized expansion tank or other approved device having a similar function to control thermal expansion. (UPC 608.3) Install per specifications.
- Mechanical rooms with a floor drain or a standpipe and subject to infrequent use require trap primers or other approved automatic means of maintaining their water seals. The trap primer valve is accessible. Check to see that it is working by verifying water is in the trap. (UPC 1007)
- Combustion Air: See **GENERAL** for details.
- Fuel fired water heaters can't be installed in a room used as a storage closet. A water heater installed in a bedroom or bathroom needs to be installed in a sealed enclosure so that combustion air will not be taken from the living space. Direct-vent water heaters are not required to be installed within an enclosure. (M2005.2, G2406.2, UPC 505.1)

Furnace

- Furnace and Air Handler minimum working space clearance – sides min. 3"; total min. 12" bigger than appliance, except replacement appliances. (M1305.1.1)
- Maintain required clearances to combustible construction as specified in the listing. (M1402.2, M1306.1)
- Clearance from grade: Equipment supported on concrete pad or approved material extending not less than 3" above the adjoining ground. (M1305.1.4.1)
- Condensate lines are required to drain by gravity to an approved drain or condensate pump. (G2427.9, , M1411.3)
- Condensing Appliances: Vent per installer's instruction. (G2427.8)
- Seal ducts to prevent leaks, and test per RS-33, unless located entirely within the conditioned space of the building. (WSEC 503.10.2 / 101.3.2.6)

Whole house ventilation systems options

The IRC as amended by the State of Washington allows many options to make air changes within a dwelling unit. The attached checklist is not a comprehensive or exhaustive code comparison. (Section M1508)

Intermittent Whole House ventilation using Exhaust Fans (1508.4)

- Whole house fan located $\leq 4'$ from the interior grille have a sone rating on fan 1.0 or less per HVI 915. Remotely mounted fans are to be acoustically isolated from structural elements and solid duct work. (M1508.4.2)
- A readily accessible 24 hour timer, set to operated 8 hours /day and tied to exhaust fan. (M1508.4.2)
- Label affixed to controls: "Whole House Ventilation. (See operating instructions)". (M1508.4.2)
- Outdoor air inlets not less than 4 sq.in. in each habitable room. (1508.4.5)
- Doors undercut minimum 1/2" where separated from exhaust source. (1508.4.5)
Note: Exhaust only ventilation systems do not require outdoor air inlets if the home has a ducted forced air heating system that communicates with all habitable rooms and the interior doors are undercut to a minimum of 1/2" above finish floor covering.

Continuously Operating Exhaust Ventilation Systems (M1508.2)

- Continuously Operating Exhaust Ventilation Systems shall provide flow rates (CFM) per Table M1508.2. (based on square foot of floor area, and number of bedrooms).

Whole House Ventilation Integrated with Forced Air System (M1508.5)

- Screened outdoor air inlet to return air plenum with motorized damper. (M1508.1, M1508.4)
- Outdoor air inlet duct connection to the return air stream located within 4' upstream of the forced-air blower. (M1508.1)
- A readily accessible 24 hour timer, set to operated 8 hours /day and tied in to furnace blower and motorized damper. (M1508.2)
- Label affixed to control: "Whole House Ventilation (See operating instructions)". (M1508.2)

Intermittent Whole House Ventilation Using Supply Fan (M1508.6)

- Uses inline supply fan. (M1508.6)
- Outdoor air must be filtered before it is delivered to habitable rooms. (M1508.6.1)
- Outdoor inlet located downstream of blower when connected to the supply side. (M1508.6.2)
- Outdoor inlet minimum 4' upstream when connected to the return side. (M1508.6.2)
- A readily a readily a readily accessible 24 hour timer, set to operated 8 hours /day and tied in to the inline supply fan. (M1508.6.4)
- Label affixed to control: "Whole House Ventilation (See operating instructions)". (M1508.6.4)

Whole House Ventilation Using a Heat Recovery Ventilation System

- All ducts must be sized per manufacturer. Also, heat recovery ventilation systems shall have a filter on the upstream side of the heat exchanger in both the intake and exhaust – efficiency min. value MERV of 6. (M1508.7.1)
- Supply ducts in conditioned space upstream of the heat exchanger insulated to minimum R4. (M1508.7.3)
- A readily accessible 24 hour timer, set to operated 8 hours /day and tied in to the inline supply fan. (M1508.7.2)
- Label affixed to control: "Whole House Ventilation (See operating Instruction)". (M1508.7.2)

Outdoor Air Inlets (1508.4.5 / 1508.5.4 / 1508.6.6 / 1508.7.4)

- Inlets are screened.
- Inlets located so as not to draw air from any of the following locations:
 - a) Within 10' of an appliance vent outlet, unless such vent outlet is 3' above the outdoor air inlet.
 - b) Where it will pick up objectionable odors, fumes or flammable vapors.
 - c) A hazardous or unsanitary location.
 - d) A room or space having any fuel burning appliances therein.
 - e) Within 10' of a vent opening for a plumbing drainage system unless the vent opening is at least 3' above the air inlet.
 - f) Attic, crawl spaces or garages.

Range Cooktop

- Combustibles installed not less than 24" from open top broilers. See manufacturer's installation instructions. (M1505.1, G2447.5)
- Distance above top of cook top to unprotected combustible material not less than 30". (M1901.1, G2447.5)
- Clearance to adjacent combustibles surfaces per the manufacturer's installation instructions. (M1901.2, G2447.4)
- Make-up air is required when the range exhaust fan exceeds 400 cfm. Such make-up air systems shall operate simultaneously with the exhaust fan. (M1503.4)

Fireplace

Fireplace

- Factory built fireplaces certified, listed and labeled. Tested and certified to WA. St. Bldg. Code standard 31-2. Testing performed by WA ST. DOE, and US. EPA accredited laboratory. (R1004.1.1.)
- Certified Masonry and Concrete fireplaces, and heaters - tested and certified to WA. St. Bldg. Code standard 31-2. Testing performed by WA ST. DOE, and US. EPA accredited laboratory. (R1001.7.1, R1004.1.2, M1415.1)

- Solid Fuel burning appliances and fireplaces – tight fitting metal / ceramic doors, and certified to test No. 11-Negative pressure test, Section 12.3, of ULCS627-M1984 for outside combustion air – duct 4” min., and 20’ max. length. (R1006.2)
- Hearth extensions are to be readily distinguishable from the surrounding floor and in accordance with the fireplace listing. (R1004.2)
- Installed per manufacturer’s installation instructions when installed in a solid fuel burning fireplace. (Decorative Gas Fireplace)(G2432.1)
- Penetrations sealed with listed materials per manufacturer’s installation instructions. (G2432.1)
- Appliance shutoff valves shall be located in the same room, and within 6’ of the appliance. Appliance shutoff valves located in fireplace firebox shall be installed per the appliance manufacturer’s instructions. Shutoff valves for vented decorative appliances and room heaters shall be permitted to be installed in a remote area from the appliance where such valves are provided with: ready access; permanent identification; and serve no other appliance. Shutoff valve installed at a manifold – within 50’ of appliance, but other req’s apply, as above. (G2420.5.1, and 2.)
- Decorative shrouds used at chimney terminations are to be listed and labeled for use with specific chimney system. (R1004.3, R1005.2)
- Gas logs in solid fuel burning fireplace are installed per manufacturer’s instructions. (G2420.5.1, G2433.1)
- Gas logs, when equipped with a pilot, have a listed safety shutoff valve. (G2420.5, G2432.2)
- When retrofitting gas log units in masonry fireplaces, dampers must be blocked open per manufacturer’s installation instructions. (G2432.1 see IRC commentary)

See above. **Laundry Room**

- A 4” metal dryer exhaust duct is installed with smooth interior. Install per the manufacturer’s instructions. (G2439.5.1, M1502.4.1)
- A permanent label identifying the length of effective length of the duct shall be installed when the duct is concealed within the building construction. (M1502.4.5).
- Approved flexible listed metal duct connector up to 8’ long, may connect the dryer to the vent, but may not extend into wall, floor or ceiling. (G2439.5.4, M1502.4.3)
- Minimum 100 square inches of make up air for closets designed for the installation of gas clothes dryers or other approved means. (G2439.4)
- 2 Methods for determining dryer duct length:
 - 1) Exhaust duct doesn’t exceed 25’ for electric dryers, and 35’ for natural gas dryers. Deduct 2.5’ for each 45-degree elbow and 5’ for each 90-degree bend;
 - 2) Max. length determined by the manufacturer’s installation instructions when make and model of dryer are provided to the code official at rough in. (M1502.4.4 & exception & G2439.5.5)

Crawl Space and Attic

With limited exceptions all new duct work that is subject to installation under the 2009 WSEC is required to be installed within the conditioned space. Contact the local jurisdiction to determine what code cycle will be used for inspection.

- Flex duct is supported per manufacturer’s installation instructions (a maximum of every 4’) and is installed without kinks or tight bends. (M1601..2 & SMACNA Standards)
- Ducts in crawl spaces are supported at least 4” above the ground.(1601.4.7)
- Ducts, boots and connectors used for heating or cooling insulated to R-8 (WSEC table 5-11).
- Insulate all exhaust ducts in unconditioned spaces with R-4 (bathroom, range, etc.) (R1508.4.4)
- When equipment is installed in a crawl or attic space a light switch and outlet is required at or near appliance(M1305.1.4.3, M1305.1.3.1)
- Verify that the passageway of continuous solid flooring not less than 24” wide from attic access to 30” wide work platform in front of furnace has been installed. (M1305.1.3, M1305.1.4)
- Access opening large enough to remove largest piece of equipment, but not less than 30” x 22”. (M1305.1.3, M1305.1.4)
- Access opening not more than 20 feet from equipment. (M1305.1.3, M1305.1.4)

General

- Weather protect exterior gas line. (G2415.9)

- Appliances installed in outdoor locations – listed or protected from outdoor environmental factors. G2406.3)
- Louvers and grills are to be sized to account for the net free area of the grill. Wood louvers will be assumed to have 25% free areas and metal louvers and grills will have a 75% free area. Screens are not to have a mesh size smaller than ¼". (G2407.10)
- Combustion air ducts from outside of the building . (. (M1701.1.1, M1702.3, M1703)GENERAL RULES FOR SUPPLING COMBUSTION AIR ARE BELOW. For specific application contact the local jurisdiction
 1. For vertical ducts: (2) openings, each having 1square inch per 4000 Btu/h of total input of all appliances in the space. (M2407.6.1)
 2. For horizontal ducts: (2) openings each having 1 square inch per 2000 Btu/h of total input of all appliances in the space. (M2407.6.1)
 3. One opening in the upper 12" and one opening in the lower 12" of the room. (M2407.6.1)
 4. When the one opening method is used, locate the opening within 12" from top of enclosure and provide 1 square inch per 3000 Btu/h or total input rating of all appliances in the space. (G2407.6) (M2407.6.2)
 5. The minimum cross sectional area of each vent opening is 3".(M2407.6)
- Combustion air obtained from outside of the building, when the building is of ordinary construction (homes built prior to 1986) and the area of the room is less than 50 cubic feet per 1000 Btu/h of aggregate input rating of appliances. (G2407)) See also Construction Tip Sheet 7, Water Heaters.
 1. The minimum cross sectional area of each vent opening is 3 inches .
 2. One opening in upper 12" and one opening in lower 12" of room.
 3. Where vertical ducts are used each opening requires 1 square inch per 4,000 Btu/h of total input rating of all appliances in the space. (G2407.6.1)
 4. Where horizontal ducts are used each opening requires 1 square inch per 2,000 Btu/h or total input rating of all appliances in the space. (G2407.6.1)
 5. When the one opening method is used, locate the opening 12" from top of enclosure and provide 1 square inch per 3000 Btu/h or total input rating of all appliances in the space. (G2407.6.2)
- When the building is of ordinary construction and the area of a confined space is less than 50 cubic feet per 1000 Btu/h of aggregate input rating of appliances, combustion air can be taken from an adjacent space when installed as follows: (G2407.5.1))
 1. Minimum of 100 sq.in. of combustion air is required.
 2. One opening in upper 12" and one opening in lower 12" of room.
- All appliances secured in place per manufacturer's listing. (M1307.2, M1401.1)
- Confirm that there is a heat source in each habitable room (R303.8)