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 <p><i>a service of eCityGov.net</i> <b>MyBuildingPermit.com</b></p>			<b>INSPECTION CHECKLIST</b> <b>Residential Mechanical Rough In</b> April 2011		
<i>Mercer Island</i>	<i>Mill Creek</i>	<i>Sammamish</i>	<i>Snohomish County</i>	<i>Snoqualmie</i>	<i>Woodinville</i>

## 2009 Codes

This checklist is intended for use to prepare for an inspection. This is only a general list and is not intended to address all possible conditions. References are to the 2009 International Residential Code (R = Residential, M = Mechanical, G = Gas) the 2009 Uniform Plumbing Code (UPC), the 2008 National Electrical Code (NEC), and the 2009 Washington State Energy Code (WSEC).

**Please verify the following before calling for inspection.**

### Permits and Plans

- Job address is posted in a visible location. (R319)
- Permit and approved plans are on site and accessible to the inspector. (R105.7, R106.3.1)
- Permit information is correct (address, permit number, scope of work, etc). (R105.3)
- Duct rough-in test affidavit to be on site and available to the inspector. Max. leakage 6 CFM per 100 Sq. Ft. with air handler installed / 4 CFM per 110 Sq. Ft. w/o air handler installed. (WSEC 503.10.3.2)

### Forced-Air Furnace

**General: It is important to note that there are exceptions to these general code references, if you question a specific application of the code the best way to resolve it is to first research the code at the local library then contact the jurisdiction that will issue the permit and do the inspections.**

- Fuel burning appliances cannot installed in sleeping rooms, bathrooms, toilet rooms, storage closets , or in a space that opens into such rooms or spaces unless they are direct vent or listed for use within living space. (G2406.2).
- Heat producing equipment installed shall maintain clearances to combustibles as required by the listing of the appliance. (M1402.2, 1306.1)
- Furnace room passageway minimum 24" wide. (M1305.1.2)
- M1305 has specific requirements for installation of mechanical equipment in attics and crawl spaces, consult the IRC for general requirements and the installation instructions for the appliance.
- Working space 30" deep to height of unit or minimum 30", clearance of 3" along sides, back and top with a total width if the space being at least 12" wider than the furnace. Furnaces having a firebox open to the atmosphere shall have at least a 6" working space along the front combustion chamber side. (M1305.1)
- Electrical receptacle is required at or near the appliance. (M1305.1.3.1) (Within 25ft. per NEC 210.63)
- Means of disconnect required within sight of appliance or the breaker is to be capable of being locked in the open position. (NEC 422.31(B))
- Switch controlled lighting provided for servicing of equipment. (M1305.1.1 & M1305.1.4.3 )
- Refer to the listing and manufacture installation instructions along with section M1409 for the installation of a wall furnace.

#### **Under floor/Attics**

- When a furnace is installed in an underfloor area it is suspended a minimum of 6" above grade or installed on a slab extending above adjoining grade. (M1305.1.4.1)
- When equipment is installed on wood platforms the framing and sheathing is pressure treated when installed within 18" of soil to bottom of framing. (R317)

- Excavations for equipment have specific requirements check the installation instructions and IRC - M1305.1.4.2 for minimum requirements.

### Garage

- Equipment which has a flame, generates a spark or uses a glowing ignition source is open to the space in which it is installed and is elevated such that the source of ignition is at least 18" above the floor. (M1307.3)
- Ducts which penetrate a wall or ceiling separating the garage from the dwelling are 26 gauge with no openings to the garage. (R302.5.2)
- Bollard or wheel stop required in front of or to the side of equipment if subject to impact by automobile. (M1307.3.1)

### Condensing Furnace (High Efficiency)

- Condensate drain required to drain by gravity to an approved drain or condensate pump. (M1411.3)
- Drain pipe minimum 3/4" with 1/8"/ft. slope. (Per manufacturer's installation instructions, and M1411.3.2).
- May drain to indirect receptor (lav tailpiece, tub over flow, etc.). (Per manufacturer's installation instructions, and M1411.3).

### Ducting

#### General

- Two story maximum vertical rise on factory made duct. (M1601.4.6)
- Duct to ground minimum 4" clearance. (M1601.4.7)
- Duct in or under concrete, encased in a minimum 2" of concrete. (M1601.1.2)
- Round ducts have crimped joints lapped minimum 1½" and fastened with (3) sheet-metal screws or rivets equally spaced around the joint. (M1601.4.1)
- Joints, seams, and fittings of ducts sealed with mastic or other approved means. (UL-181 tape). (M1601.4.1)
- Flex duct supported per manufacturer's specifications. (M1601.4.3)
- Metal duct minimum support every 10'. (M1601.4.3)
- Ducts shall not displace exterior insulation of walls, floors, or ceilings, and building cavities may not be used as ducts (M1606.1.1.7 / WSEC 503.10.1).
- Venting systems shall not extend into or pass through any fabricated air duct or furnace plenum. (G2427.3.4)

#### Return Air

- Return air taken from a room or space  $\geq 25\%$  of the total volume served. (M1602.2, item 3)
- Can't be taken from bathroom, kitchen, toilet room, mechanical room, closet, furnace room, other dwelling unit, or garage. (M1602.2, item 4)
- Return air inlets not located within 10' of any fuel burning appliance fire box or draft hood located in the same space. (M1602.2, item 5, exception 3)
- Minimum return air duct size is 2 sq.in./kBtu/hr. output rating of the furnace or as otherwise specified by the manufacturer. (G2442.2) Heat Pumps – min. outside, return air, openings 6 sq.in./kBtu/hr. (Elect. Heat pumps – per UL 1995).
- Ducts shall not displace exterior insulation of walls, floors, or ceilings, and building cavities may not be used as ducts (M1601.1.5 / WSEC 503.10.1).
- Venting systems shall not extend into or pass through any fabricated air duct or furnace plenum. (G2427.3.4)

#### Insulation

- Ducts, boots and connectors used for heating or cooling insulated to R-8 in unconditioned spaces and to R-5 in cement slabs or in ground (WSEC table 5-11 / 503.9).
- Exhaust ventilation ducting insulated to R-4 (M1508.4.4).

- Ducts shall not displace exterior insulation of walls, floors, or ceilings, and building cavities may not be used as ducts (M1601.1.5 / WSEC 503.10.1).

## Combustion Air

- The minimum cross section dimension for combustion air ducting is 3" (M1701.1 / G2407.6).
- Ducts shall not displace exterior insulation of walls, floors, or ceilings, and building cavities may not be used as ducts (M1601.1.5 / WSEC 503.10.1).
- Venting systems shall not extend into or pass through any fabricated air duct or furnace plenum. (G2427.3.4)
- Combustion air ducts cannot be screened when terminating in an attic space. (M1701.1 / G2407.11 item 5)
- When combustion air is obtained from the attic or crawl space they must be sufficiently vented. (M1701.1 / G2407.6).
- In buildings of unusually tight construction, combustion air shall be obtained from outside the building. (M1701.1 / G2407.1).
- Indoor combustion air openings - each opening shall be 1 sq. in. per 1,000 Btu/h input of all appliances, but not less than minimum of 100 square inches (M1701.1 / G2407.5.3.1).
- Outdoor combustion air openings - only the lower of the 2 combustion air openings can be connected to an under floor area. The openings (attic and crawl) shall communicate directly / freely with the outdoors. (M1701.1 / G2407.6.1).
- Where vertical ducts are used to provide combustion air from the outdoors, each opening requires 1 sq. in. of opening per 4,000 Btu/h of total input rating of all appliances in the space. (M1701.1 / G2407.6.1 – Two Opening Method).
- Where horizontal ducts are used each opening requires 1 sq. in. of opening per 2,000 Btu/h of total input rating of all appliances in the space. (M1701.1 / G2407.6.1 – Two Opening Method).
- When the one opening method is used the opening requires 1 sq. in. of opening per 3,000 Btu/h of total input rating of all appliances in the space and be within the top 12" of the space. The openings shall communicate directly / freely with the outdoors. (M1701.1 / G2407.6.2)
- Outside combustion air openings are to be screened with ¼ to ½ inch mesh corrosion-resistant material. (M1701.1 / G2407.10).
- Combustion air may be drawn from inside the building if of ordinary tightness and the conditioned space is greater than 50 cubic feet per 1,000 Btu/h input for all fuel burning appliances combined (M1701.1 / G2407.5.1).

## Vents and Connectors

- Venting systems are to be adequately supported for the weight of the material used. (M1801.7, G2427.6.1)
- Where two gas appliances are vented through a common vent connector it is equal to largest connector plus 50% of the smaller flue outlet and not less than the combined area of the flue outlets for which it acts as a common connector. (G2427.10.3.4)
- Vent connector clearances to combustibles per manufacturer's listing or performance standards. (M1803.3.4, M1306.1, G2427.7.8)
- Single wall vents cannot penetrate a wall, floor or ceiling without a listed pass through assembly, except for gas vents - exterior combustible walls only – with a "ventilated metal thimble". (M1801.1, G2427.7.7 – see req's. 1-3)
- Vent terminations installed per the manufacturer's listing. (M1804.1 / G2427)
- Exhaust vent terminations for mechanical draft and direct venting shall not be 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 less than 3' above any forced air intake within 10', nor within 12" of grade. (M1804.2.6 items 1 through 7, G2427.8) (IRC appendix C) (M1804.2.6 & G2427.8 )
- Gas vent terminations for listed caps, for roof / wall size and clearances – see table G2427.6.3. Gas vents < 12", and not less than 8' from vertical wall or obstruction, shall terminate above roof per table (pitch of roof). Gas vents > 12" shall terminate 2' above, and 10' away from roof. (G2427.6.3)

- Vent terminal (except direct-vents) not mounted directly above or within 3' horizontally of a gas meter or oil tank. (M1804.2.5,6)
- Vent terminal no closer than 3' to an interior corner formed by (2) perpendicular walls. (M1804.2.6)
- Power exhaust terminals not located within 10' of property line and adjacent buildings, and 7' above any finished ground level public walkway. (M1804.2.6 / G2427.3.3.6)
- Venting systems shall not extend into or pass through any fabricated air duct or furnace plenum. (G2427.3.4)
- A chimney or vent connector shall not pass through any floor or wall ceiling, and shall not pass through a wall or partition unless the connector is listed and labeled for wall pass-through, and installed per the listing. (M1803.3.1, & G2427.7.6).
- 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, secured in place and shall be installed to provide clearance between the vent and the combustible insulation materials, specified by the vent manufacturer. (G2426.4)
- Venting supported per manufacturer's listing. (M1801.1 & 1801.7)

## Appliances

### Clothes Dryer

- Exhausted per manufacturer's instructions. (M1502.1 & G2439.1)
- Clothes dryer exhaust ducts of metal with smooth interior surfaces, with joints running in the direction of air flow. (M1502.4 & G2439.5)
- Protective shield steel plates of 0.062 thickness, where nails or screws are likely to penetrate clothes dryer exhaust duct – incl. @ framing members < 1-1/4" between duct and finished face of framing member. (M1502.5, & G2439.5.3)
- No screws used to attach connector to duct. (M1502.4.2 & G2439.5.2)
- Duct connector 4" minimum or appliance outlet size. (M1502.4.1, G2439.5)
- 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)
- Clothes dryer ducting run independently of other ducted systems, and shall convey moisture to the outdoors (except listed and labeled condensing ductless clothes dryers). (M1502.2 & G2439.1)
- Exterior termination is backdraft dampered, with no screens, and 3' min. from away from any openings into building. Clothes dryer exhaust ducts shall not connect to: vent connectors; vent; or chimney. (M1502.3, G2439.3)
- Clothes dryer ducting concealed in construction must be labeled with the equivalent length. Label shall be located within 6' of the exhaust connection. (M1502.4.5, G2439.5.6)
- Dryer exhaust duct required at time of occupancy. If dryer not installed, exhaust duct shall be capped at the location of the future dryer (except listed and labeled condensing ductless clothes dryers) (M1502.4.6, G2439.5.7).
- Electric dryer transition duct shall be single length, listed and labeled, UL 2158A, and maximum length 8' long. Transition ducts shall not be concealed within construction. (M1502.4.3, G2439.5.4)
- Gas dryer gas connectors maximum 6' long, measured along centerline of the connector. One connector only. (G2422.1.2.1)
- Gas shutoff valve installed immediately ahead of connector, and in the same room. (G2422.1.2.4, G2422.5)

### Range

- Vertical clearance to combustibles is 30" minimum or per manufacturer's listing. Minimum clearance reduced to 24" (Gas cooking appliance) with one of three exceptions. (M1901.1)(G2447.5,1,2,3.
- Gas connector maximum 6' long maximum. (G2422.1.2.1)
- Shutoff valve installed immediately ahead of connector. (G2422.1.2.4)

### Range Hood Duct

- Terminates outside, is air tight and is equipped with a backdraft damper. (M1503.1)
- Ducting is galvanized steel, stainless steel, or copper, with a smooth interior. Exception: Ducts for domestic cooking appliances equipped with downdraft exhaust system, can be schedule 40 PVC, and comply with all 5 exception requirements. (M1503.2.1,2,3,4,5.)
- Domestic open-top broiler units shall have a metal exhaust hood, having a minimum thickness of 28 gauge with ¼" clearance between hood and the underside of combustible materials or cabinets, and clearance of min. 24" between cooking surface to combustible materials or cabinets, unless listed and labeled for broiler units with integral exhaust system. (M1505.1)

### 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)

### Air-Conditioning

- Cooling coils installed downstream (return side) from heat exchanger. (M1411.2)
- Working space minimum 30" x 30". (M1305.1)
- Condensate disposal line to an approved place of disposal, but not to public street, alley, or create a nuisance. (M1411.3)
- Auxiliary and secondary drain systems (incl. pan) in addition to condensate disposal, where damage to any building components will occur from overflow or stoppage of condensate drain piping (4 – methods, incl. UL 508 shutoff switch).(M1411.3.1.1,2,3,4.).
- Condensate line minimum 3/4" and sloped to drain termination without sags – 1/8 unit in 12 units (1-percent slope). (M1411.3 & UPC 814.1)
- Refrigerant lines are to be pressure tested prior to start up of the compressor if required by manufacturer's installation instructions for residential systems, or when piping is brazed. (M1404, M1411.1 / ANSI / ASHREA 34.
- Refrigerant lines shall be insulated to R-4, and perm rating of max. 0.05. (M1411.5).
- Refrigerant circuit access ports shall be fitted with the locking-type tamper-resistant caps. (M1411.6)

### Exhaust Venting

- Source specific ventilation fans are required in kitchens, bathrooms, water closet rooms, laundry rooms and indoor swimming pools, spas, or other rooms where water vapor or cooking odor is produced. (M1507.1, M1507.3.1, and Table M1507.3)

- Bathroom fans 50 cfm minimum, and kitchen fans 100 cfm minimum. (M1507.3.1, HVI 916 / AMCA 210)
- All exhaust ducts shall terminate outside the building, and must be equipped with back draft dampers and insulated to a minimum of R-4 in unconditioned spaces such as attics and crawlspaces. (M1507.3.3)

## Whole house ventilation systems

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.