

2014 British Columbia Building Code Changes

A City of Kelowna interpretation of the
2014 Building Code 9.32 Ventilation
changes

The following changes reflect the most notable revisions and staff interpretations. This package is for information purposes only and does not constitute a formal or legal document. The actual British Columbia Building Code (BCBC) 2012 should be reviewed in its entirety for any design / construction applications.

9.32 British Columbia Building Code Ventilation Changes



Ducts must be insulated to the same level as required for walls if they are outside of the heated space and carrying conditioned air.

Bathroom, dryer and kitchen exhaust are exempt from this requirement though are required to be directed directly outdoors, insulated to RSI 0.75 and have a vapor barrier



Below grade may require up to an R-20 behind stack ducts located in the outside basement walls

Mechanical, electrical and plumbing components placed within an exterior wall must be insulated behind to the effective thermal resistance required for the above or below grade wall assembly.

9.32 British Columbia Building Code Ventilation Changes

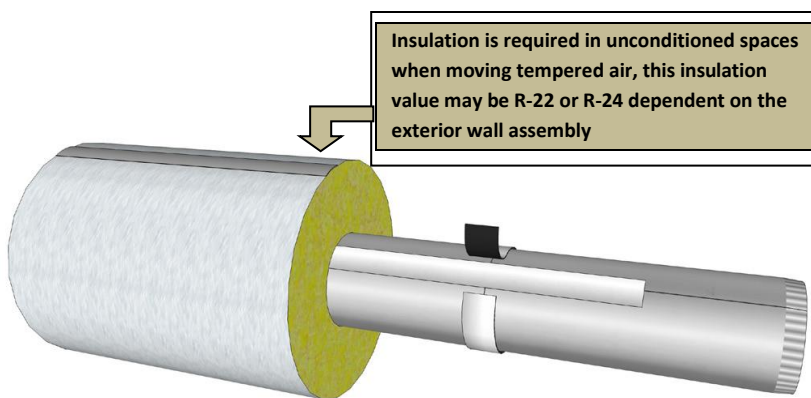
Flexible sheet air barrier materials require all joints to be

- lapped at least 50 mm (2")
- Sealed and
- structurally supported

Sealants must be non-hardening



Tuck tape is not an approved tape for use on vapor barriers



Transverse and longitudinal joints in duct work must be sealed using an approved tape or sealant when outside the heated space, insulation requirements will be the same as the exterior wall assembly

9.32 British Columbia Building Code Ventilation Changes

Heating Efficiencies



Fabric tape is not approved in the BCBC for this application



Ventilation air intake	Required
Clothes dryer vent	Required
Combined supply and exhaust ventilators	Required
Exhaust and supply fans	Required

In general, ducts are required to be equipped with a damper. The damper may be gravity operated, motorized or spring loaded. Where motorized dampers are used, they must remain in an open position if damper operation fails, such as during power outages.

9.32 British Columbia Building Code Ventilation Changes



Exterior Roof Top Heat / Cool Unit



Interior Residential Gas Furnace

HVAC equipment designed strictly for outdoor installation must be located outside
HVAC equipment must be located inside the heated space, garages even if heated are considered unconditioned space.

Air handlers for ductless splits are no longer permitted to be placed in the unconditioned attic.

9.32 British Columbia Building Code Ventilation Changes

Service Water Heating Equipment		
Electric Storage	13-71 Gal (50 to 270 L)	Standby loss less than or equal to $25 + 0.20V$ (top inlet) $40 + 0.20V$ (bottom inlet) Where V = the tank volume (in Litres)
Gas Fired Storage	Less than 75,000 BTU/Hr (22 kW)	Energy Factor (EF) must be greater than or equal to $0.67 - 0.0005V$ Where V = the tank volume (in Litres)
Gas Fired Tankless	Less than or equal to 250,000 BTU/Hr (73.2 kW)	Energy Factor must be greater than or equal to 0.8



Gas Fired Tankless Instantaneous



Gas Fired Storage HWT



Electric Storage HWT

The efficiency ratings for hot water tanks both storage and instantaneous have been adjusted in the new requirements.

9.32 British Columbia Building Code Ventilation Changes

Space Heating Equipment		
Gas Fired Furnace	Less than 220,000 BTU/Hr (66 kW)	Annual Fuel Use Efficiency (AFUE) must be greater than or equal to 92%
Gas Fired Boiler	Less than or equal to 300,000 BTU/Hr (88 kW)	Annual Fuel Use Efficiency (AFUE) must be greater than or equal to 90%
Air Cooled Unitary Air Conditioner and Heat Pump Split System	Less than or equal to 65,000 BTU/Hr (19 kW)	Seasonal Energy Efficiency Rating (SEER) of 14.5 or Energy Efficiency Rating (EER) of 11.5
Gas Fired Tankless	Less than or equal to 250,000 BTU/Hr (73.2 kW)	Energy Factor (EF) must be greater than or equal to 0.8



Minimum Efficiency 92%



Gas Fired Tankless

9.32 British Columbia Building Code Ventilation Changes



Gas Fired Boiler Minimum Efficiency 90%




**Air Conditioners now have a 14.5 SEER rating
(Seasonal Energy Efficiency Rating)**



**Heat Pumps now must have an 11.5
Energy Efficiency Rating**

The efficiency ratings for gas furnaces, boilers and hot water tanks both storage and instantaneous have been adjusted in the new requirements. Air conditioners and heat pumps also have increased efficiency ratings.

9.32 British Columbia Building Code Ventilation Changes




9.32. Ventilation - Changes

- Exhaust only ventilation no longer acceptable
- New Principal Fan Sizing Table
- Ventilation air must be distributed to each bedroom and a common area
 - 4 acceptable options
- Principal System –must run continuously
- Crawlspace Ventilation Required
- Credit for very short bath fan exhaust ducts

2

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Pre December 19, 2014 the exhaust only systems were used where a fan (bathroom) was used to create a negative pressure within the space and ventilation air was achieved through air leakage from loose building construction.



9.32.3.5. Principal Ventilation System Exhaust Fan

- Principal ventilation rate based on bedroom count & square footage
- Minimum exhaust fan air-flow rate in Table 9.32.3.5


Floor area m ²	Minimum air flow rate, L/s				
	Number of bedrooms				
	0-1	2-3	4-5	6-7	>7
< 140	14	21	28	35	42
140 - 280	21	28	35	42	49
281 - 420	28	35	42	49	56
421 - 560	35	42	49	56	64
561 - 700	42	49	56	64	71
> 700	49	56	64	71	78

5

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Post December 19, 2014 and with the introduction of a principal exhaust fan in 2006, the sizing was based on the number of bedrooms, the table above now indicates the number of bedrooms as well as floor area to determine the principal ventilation fan sizing.

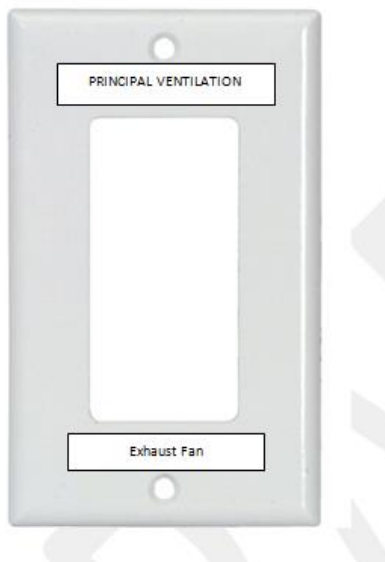
9.32 British Columbia Building Code Ventilation Changes



9.32.3.5. Principal Ventilation System Exhaust Fan

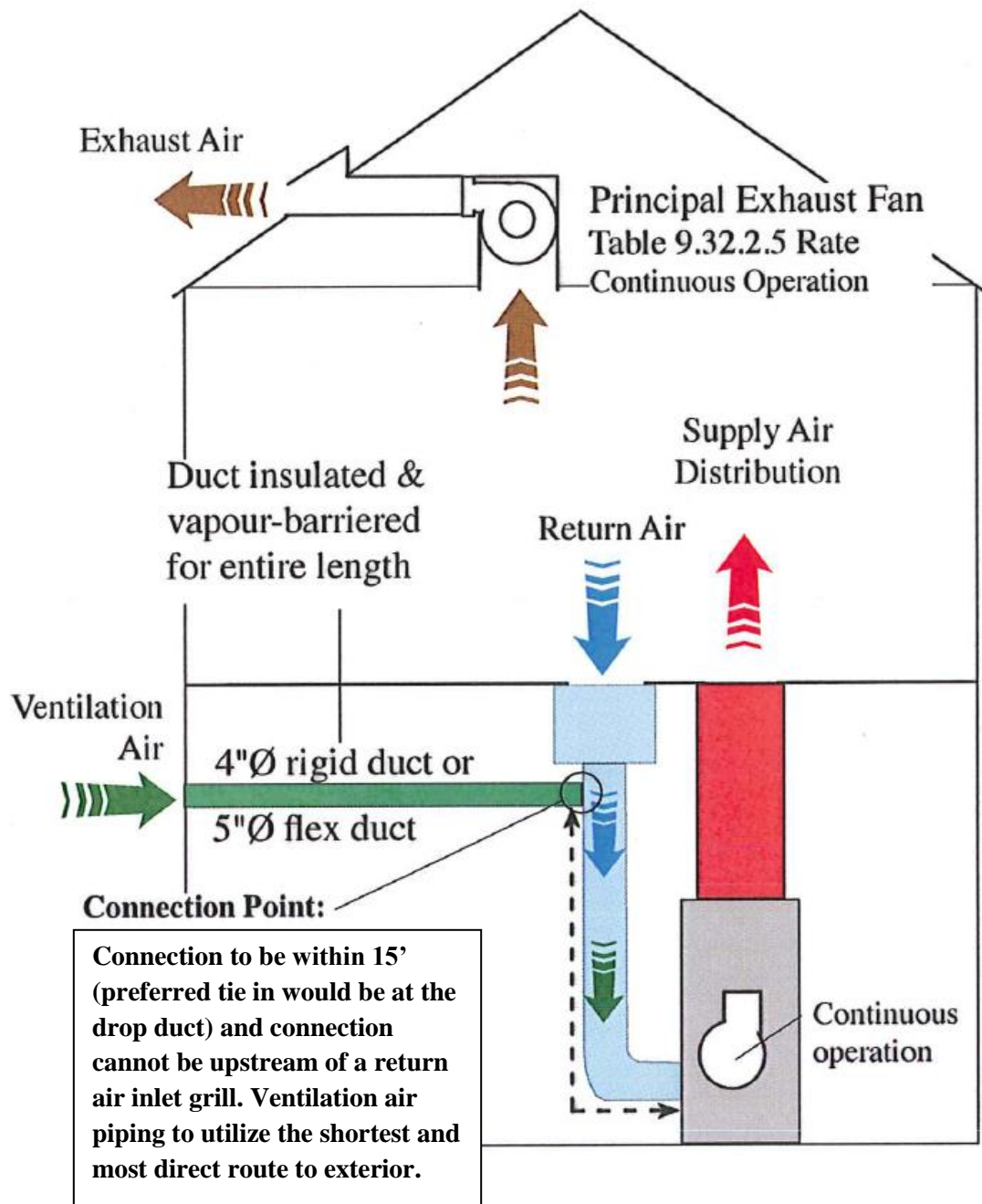
- Principal exhaust fan capacity @ 50 Pascals
- Designed to run continuously
- Controlled by dedicated switch
 - Clearly marked “principal Ventilation Exhaust Fan”
 - Two settings: on & off
 - Accessible for servicing
 - If capable of running at multiple flow rates, must have a separate switch so low rate is not less than required
- Sound rating not to exceed 1.0 sone

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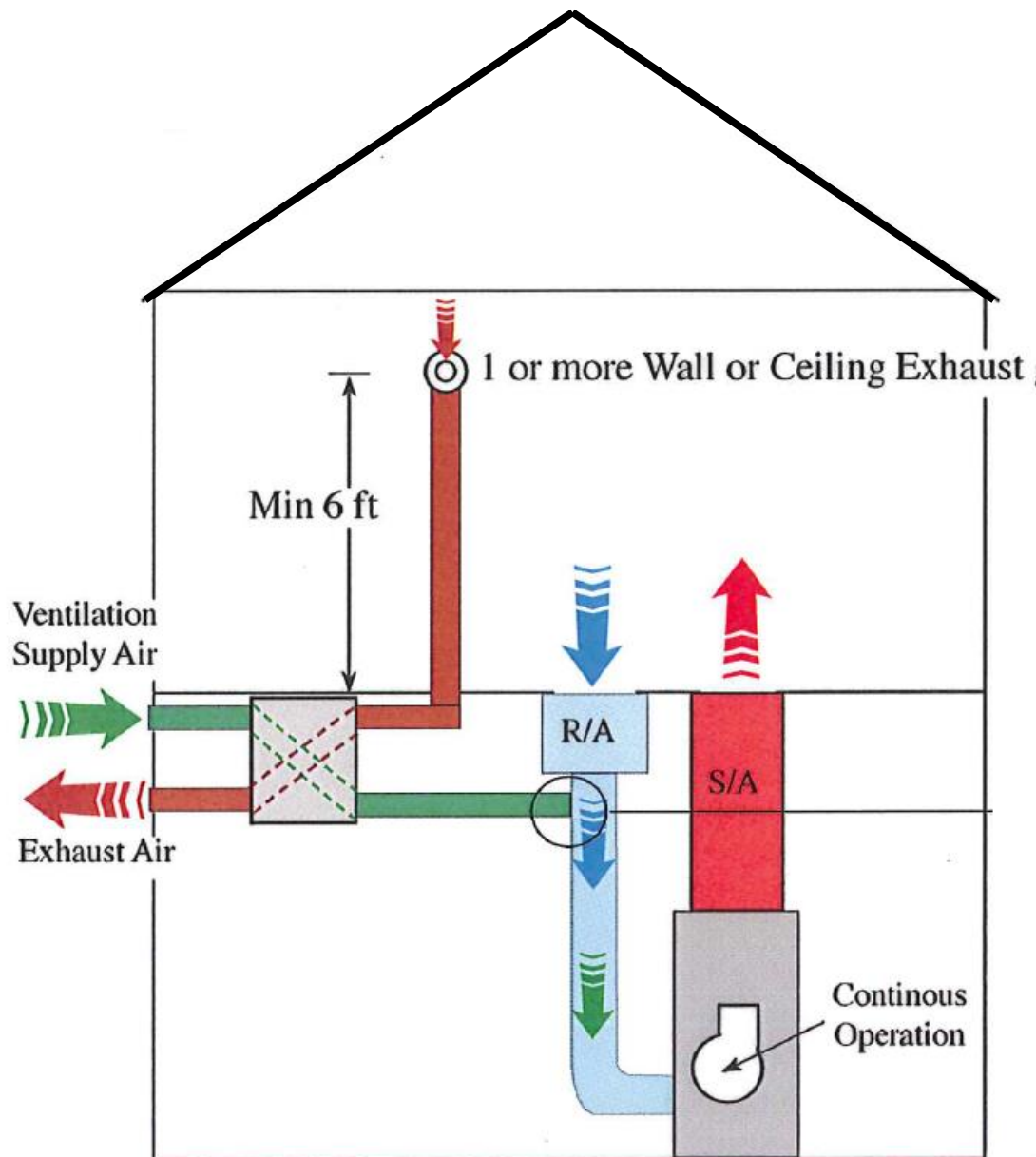
The primary ventilation system is required to run continuously, this can be achieved by the use of an HRV or a dedicated Lo-Sone fan not exceeding 1.0 sones. (noise level) A switch must be supplied between the exhaust appliance and ventilation supply this switch must be labeled as above. The switch located within a bathroom or the fan switch on the thermostat or power switch for the air handler located in the mechanical room may not be used for this purpose.

9.32 British Columbia Building Code Ventilation Changes



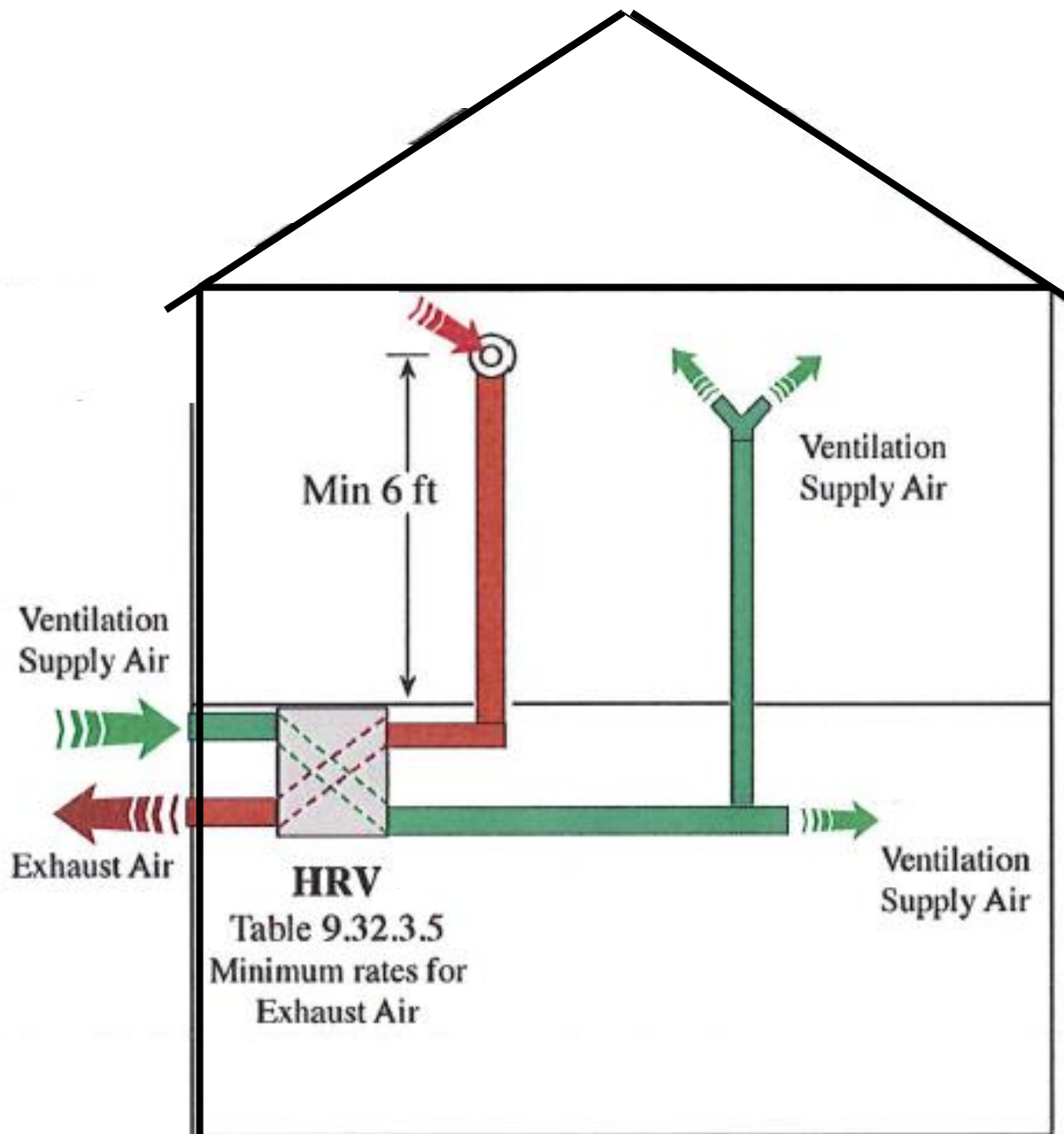
Contractors / owners now have 4 options to deliver ventilation air. Option1 is utilizing the forced air system interlocked to the primary ventilation fan. The ventilation air piping is to be as short and direct to the duct connection to ensure positive exterior air draw. A secondary suite will require a separate primary ventilation exhaust sized to square footage and number of bedrooms.

9.32 British Columbia Building Code Ventilation Changes



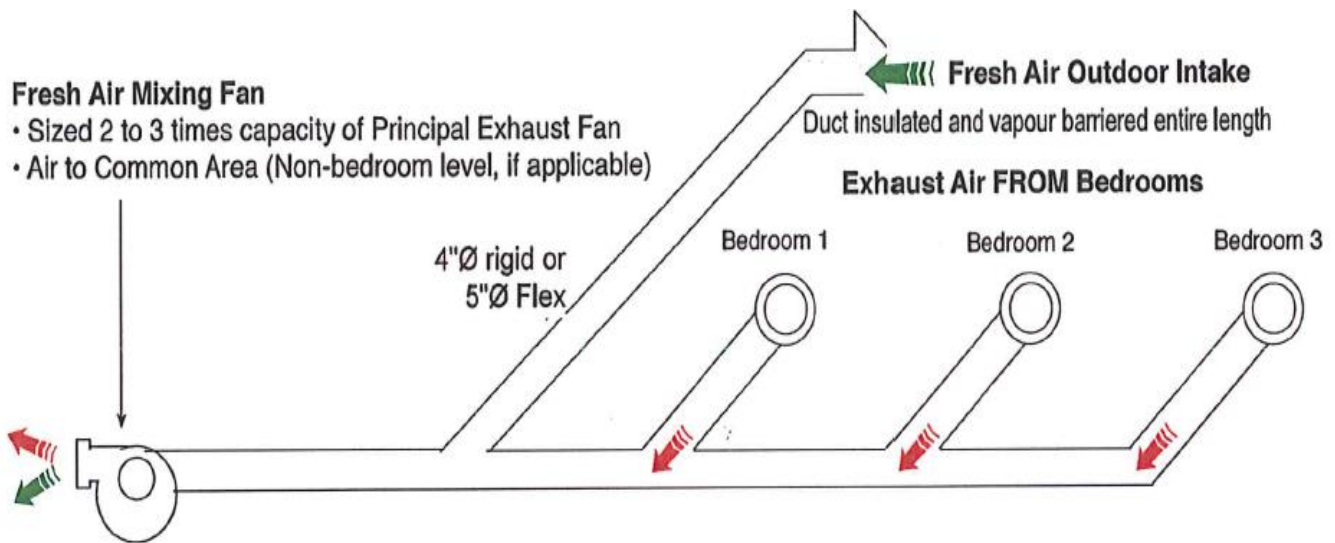
2nd option is to incorporate an HRV as the primary ventilation fan. The HRV would utilize the appliance blower to distribute ventilation air while the exhaust would be drawn from the washrooms, kitchen and/or laundry areas. The ventilation air piping is to be as short and direct to the duct connection to ensure positive exterior air draw. HRV supply and exhaust must be balanced. The HRV would be interlocked to the furnace blower for 24/7 operation.

9.32 British Columbia Building Code Ventilation Changes

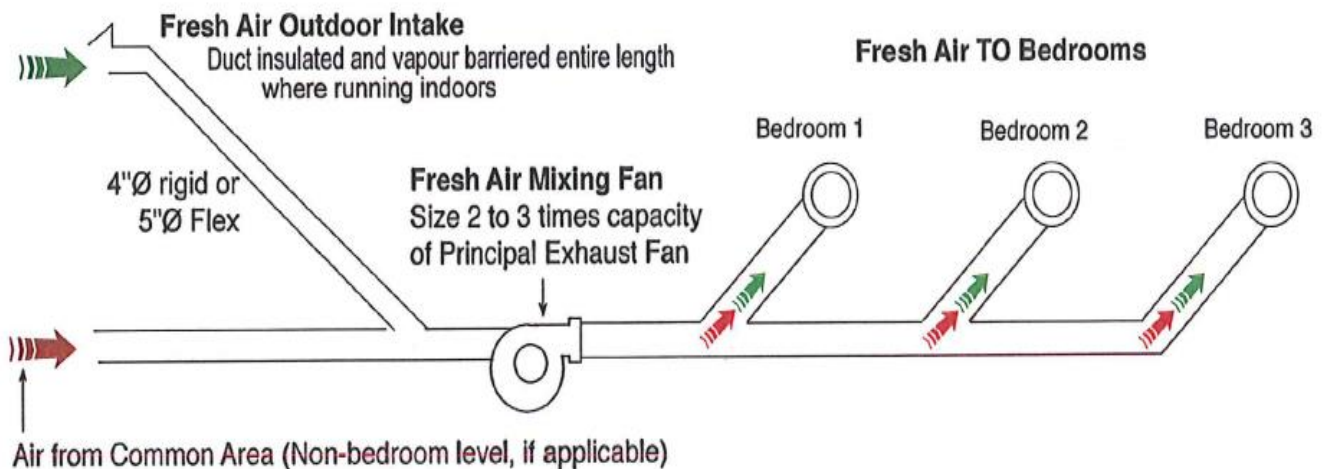


The 3rd option is to incorporate an HRV as the primary ventilation system running 24/7. The supply must be introduced into each bedroom and main living areas at a minimum of 6' from the finished floor, exhaust may be from the bathrooms, kitchen or laundry areas and balanced to the supply. This system may be installed in conjunction with forced air though is more likely to be installed as a stand alone when hydronics or electric is being used as the main heat source.

9.32 British Columbia Building Code Ventilation Changes




Example 3B: CRV System—Supply Bedrooms and Exhaust Common Area



The 4th option is a system when forced air is not being installed. A primary ventilation fan is installed and interlocked with a distribution fan sized 2-3 times the primary ventilation fans capacity. The air discharge / supply grills should be installed no closer than 2m from the floor ensuring that the cooler air is mixed with tempered air maintaining a suitable comfort level.

9.32 British Columbia Building Code Ventilation Changes




9.32.4. Protection Against Depressurization

- Make-up air is required for large capacity exhaust equipment (0.5 air changes/hour) when:
 - House has appliance subject to back drafting or
 - House is located in area classified as Radon area 1 (table C-3 in appendix C)

21

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Should the calculations provided on the Mechanical Ventilation Check list provided by the HVAC installer indicate single exhaust appliances exceed the ½ air change per hour, make up air sized accordingly to the excess exhaust must be provided to the dwelling. As Kelowna is in a high Radon Area, Should a complete Radon mitigation system be installed, make up air will not be required



9.32.3.8. Ducts

- Exhaust ducts must discharge to outdoors
- Exhaust and supply ducts:
 - Must be sized as required by manufacturer & equivalent diameter as per Table 9.32.3.8 (3)
 - Need to be air-sealed
 - Insulated & provided with vapour barrier

19

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Exhaust from bath fans, primary ventilation fans and range exhaust ducts must be vented directly outdoors, insulated with an RSI of 0.75 (R-4) and have a continuous vapor barrier.

9.32 British Columbia Building Code Ventilation Changes

HRV & PRIMARY VENTILATION EXHAUST GUIDELINES

An HRV can save 75 percent or more of that wasted energy, as it pushes out stale air, pulls in fresh air, and with little or no mixing of the two air streams, transfers the heat or chill from the outgoing air to the incoming supply. The BCBC requires that the minimum efficiency of the HRV not be less than 60%.

An HRV is an effective way to ventilate a very “tight” (well-insulated) house.
A tight house collects more humidity and pollution than one with a lot of air infiltration.

An HRV may be sized in two (2) manners;

1. HRVs are sized to ventilate the whole house as per BCBC at a minimum rate of 0.5 air changes per hour. To calculate, simply take the square footage of the house (including basement) and multiply by the height of the ceiling to get the cubic volume. Then, divide by 60 and multiply by 0.5.

Example;

1100 per floor = 2200sq ft x 8' ceiling = 17,600 cubic feet divide by 60 = 293 CFM then x by the ½ air change per hr .5 = an HRV that is sized to deliver 147 CFM.

Method #2

The following chart from the CAN/CSA F326-M91 Residential Mechanical Ventilation Systems may be used for calculating the ventilation required.

1. *Size the HRV capacity for the amount of potential occupied space in the house:*
 - 20 CFM for master bedroom and unfinished basement
 - 10 CFM each for all other habitable rooms

Room	No. of Rooms	CFM (L/s)	CFM Required
Master bedroom		x 20 cfm (10 l/s)	
Basement	Yes or No	If yes add 20 cfm (10 l/s)	
Bedrooms		x10 cfm (5 l/s)	
Living Room		x10 cfm (5 l/s)	
Other		x10 cfm (5 l/s)	
Kitchen		x10 cfm (5 l/s)	
Bathroom		x10 cfm (5 l/s)	
Laundry Room		x10 cfm (5 l/s)	
Utility Room		x10 cfm (5 l/s)	
Total Ventilation Required (add last column)			

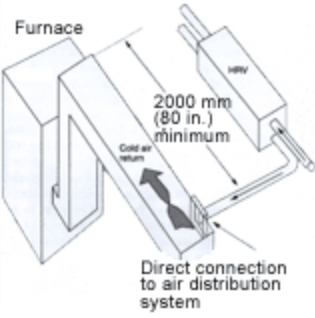
9.32 British Columbia Building Code Ventilation Changes

Typical 3 bedroom home using CAN/CSA F326-M91

• Master	20cfm
• Undeveloped basement	20cfm
• Bedrooms x2	20cfm
• Living	10cfm
• Kitchen	10cfm
• Bathroom x2	10cfm
• Laundry	10cfm
• Dining area	10cfm
• Den	<u>10cfm</u>

HRV required CFM 120

Areas of the installation to Review

1. *Install permanent air flow measuring stations and balancing dampers on air supply and exhaust ducts and balance the flow rates to be within 10% of each other.*
Why? – To keep house pressures in balance and prevent excessive HRV freeze ups.
2. *Ensure that the insulated flexible duct used to bring the cold outside air into the HRV is limited to 4.5m in length or less, that its terminations are well sealed at both the HRV and inlet hood.*
Why? – Duct length in excess of 4.5m from the exterior hood to the furnace blower is a 9.32 requirement on a passive system, additional length may reduce the heat recovery efficiency of the HRV. Improperly sealed terminations will allow for condensation and ice build up on duct.
3. *Supply the HRV fresh air to the furnace return air plenum at least six feet away from the furnace or to the manufacturers installation instructions.*
Why? – Dependant on exterior air temperatures, even after the heat exchange process, the HRV supply air can still be fairly cold. Proper mixing of the cold fresh air with the warmer household return air needs to be accomplished to prevent excessive cooling of a fuel fired furnace's heat exchanger. Care should be given that the connection is not upstream of a return air grill.
4. *On the exterior of the house, separate the HRV supply and exhaust air hoods by at least 6 feet or manufacturer's installation instructions and insure at least 18" clearance to ground on the intake and exhaust hoods.*
Why? – To prevent cross contamination of supply and exhaust air flows and blockage of vents by snow.
5. *Interconnect the HRV with the forced air furnace fan so that when the HRV is operating the furnace fan is also operating as per the BCBC requirement.*
Why? – To facilitate proper mixing and distribution of fresh air into all areas of the house.

9.32 British Columbia Building Code Ventilation Changes

6. *Install air flow balancing dampers on all exhaust duct branch runs.*
Why? – To enable the exhaust flow rates from each room to be adjusted
7. *Attic installations are not recommended unless the space is conditioned as per BCBC*
Why? – BCBC requires mechanical equipment be installed in a conditioned space, the conditioned air in the attic space ductwork would be required to be insulated to the same value as the above grade wall.
8. *Connecting to the HRV the clothes dryer exhaust, range exhaust and central vacuum is not recommended.*
Why? – Dryer lint, central vac exhaust lint and grease laden vapors from the kitchen exhaust will plug the filters within the HRV unit.

**An HRV can take air from behind the fridge and within the laundry room to utilize the latent heat within these areas*

GENERAL TIPS

- To maximize airflow through the ductwork system, all ducts should be kept short and have as few bends or elbows as possible.
- All duct joints must be fastened with screws, duct sealed and/or wrapped with aluminum foil duct tape to prevent leakage.
- Galvanized ducting from the HRV to the living areas in the house is recommended whenever possible, although flexible ducting 1 size larger can be used in moderation when necessary. To avoid possible noise transfer through the ductwork system, a short length (approximately 300mm, 12") of nonmetallic flexible insulated duct may be connected between the HRV and the supply/exhaust ductwork system.
- The main supply and return lines to/from the HRV must have a diameter of 150mm (6") but may be larger dependent on the HRV selected.
- Branch lines to the individual rooms may be as small as 100mm (4")
- The supply to the habitable areas must be balanced with the exhaust being returned
- Supply grills on self contained HRV's must not be located closer than 2m from finished floor
- Two or more HRV's shall not be connected in parallel to a common air supply duct, unless specifically recommended by the manufacturer.
- Two or more HRV's shall not be connected in parallel airflow to a common downstream exhaust duct.
- Passive HRV and furnace blower must be interconnected to run on a continuous basis 24hrs per day 7 days per week.
- Self contained HRV's are required by the BCBC to run 24/7

9.32 British Columbia Building Code Ventilation Changes

Primary Ventilation Fan sizing for homes NOT incorporating an HRV

For contractors / owners not incorporating an HRV the primary ventilation fan must be interlocked with the furnace to operate 24/7.

A requirement is that a switch and labeled switch plate be provided, the switch plate must indicate the switch is for the “Primary Ventilation Fan”, this switch must be independent of the fan switch in a washroom and also independent of the switch energizing the furnace or fan coil.

Sizing of the Primary Ventilation fan is determined by the number of bedrooms and floor area of the dwelling as per Section 9.32.3.5, and the chart below;

Table 9.32.3.5.
Principal Ventilation System Exhaust Fan Minimum Air-flow Rate
Forming Part of Clause 9.32.3.5.(1)

Floor Area, m ²	Minimum Air-flow Rate, L/s				
	Number of Bedrooms				
	0-1	2-3	4-5	6-7	> 7
< 140	14	21	28	35	42
140-280	21	28	35	42	49
281-420	28	35	42	49	56
421-560	35	42	49	56	64
561-700	42	49	56	64	71
> 700	49	56	64	71	78

An example of a 1700 sq foot 3 bedroom home would be sized by the 140-280 m², 2-3 bedrooms which is 28 liters per second or 56 cfm. The required fan would be 1.0 sone, and 56 cfm. The fan selected would be 60 cfm minimum.

The venting of the fan must be directly out side and sized according to the chart under 9.32.3.8 (3)

9.32 British Columbia Building Code Ventilation Changes

Table 9.32.3.8.(3)
Maximum Equivalent Duct Length⁽¹⁾, m
 Forming part of Sentence 9.32.3.8.(3)

Equivalent Diameter, mm (Cross Section Area for Rectangular Ducts, cm ²)	Flexible Duct					
	Fan Capacity, L/s					
	25	40	50	60	70	80
125 (123)	32	15	—	—	—	—
150 (177)	46	40	28	18	13	—
175 (240)	46	46	46	46	46	24
200 (314)	46	46	46	46	46	46

Equivalent Diameter, mm (Cross Section Area for Rectangular Ducts, cm ²)	Rigid Duct					
	Fan Capacity, L/s					
	25	40	50	60	70	80
100 (79)	32	15	—	—	—	—
125 (123)	46	40	28	18	13	—
150 (177)	46	46	46	42	34	24
175 (240)	46	46	46	46	46	46

Notes to Table 9.32.3.8.(3):

⁽¹⁾ The equivalent length of a duct is the length of the duct plus 10 m for the exterior hood and 3 m for each 90° elbow.

A point we need to observe is the exhaust hood /roof jack termination is equivalent to 10m (32') in length and each 90 is equivalent to 3m (10') in length each so we should never see 4" or 5" being used for the exhaust off the primary exhaust fan. 6" insulated flex has a max length of 40m (131') and 7" insulated flex has a max length of 46m (151') these sizes should be the "norm" based on the distance from the fan to exterior discharge which includes the termination and any 90's.

If rigid pipe is being used then exhaust pipe sizing will change as flex is required to be larger to accommodate the restriction in air movement.