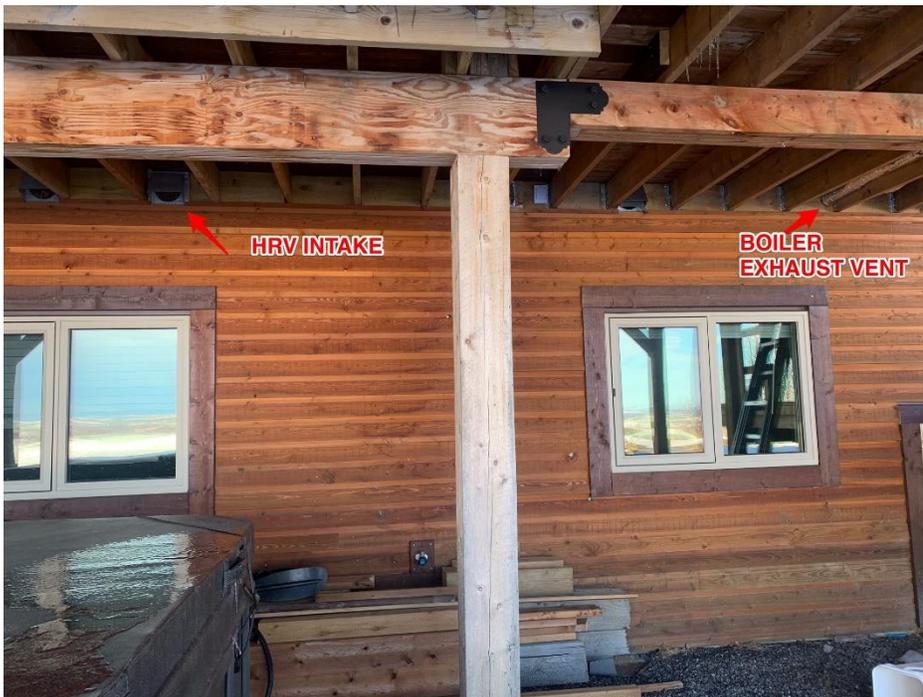


Incident Summary #II-1147502-2021 (#20824) (FINAL)

SUPPORTING INFORMATION	Incident Date	February 19, 2021	
	Location	Taylor, BC	
	Regulated industry sector	Gas - Propane system	
	Impact	Qty injuries	3
		Injury description	Occupants of the house were exposed to low levels of carbon monoxide and advised to go to the hospital. No symptoms were reported by the occupants.
		Injury rating	Insignificant
	Damage	Damage description	A Heat Recovery Ventilator (HRV) drew exhaust from three gas appliances back into the house.
		Damage rating	None
	Incident rating	Insignificant	
	Incident overview	<p>Three gas appliances exhaust vents each terminate outside. The products of combustion from these appliances included carbon monoxide.</p> <p>The HRV was operating while one or more of the gas appliances were operating, and the exhaust which contained carbon monoxide was drawn into the HRV air intake, and then into the house ventilation duct work.</p>	
INVESTIGATION CONCLUSIONS	Site, system and components	<p>Gas appliances may produce carbon monoxide (CO) as a product of combustion of natural gas. Most modern appliances produce a small amount of CO which is carried out of the appliance through its venting system to dissipate safely outside.</p> <p>Gas appliances from a house may be vented outdoors through Chlorinated Polyvinyl Chloride (CPVC) piping. Exhaust vent terminations outside may be located under decks provided that they are located at least six feet away from mechanical air intakes, the deck is fully open on a minimum of two sides beneath the deck floor, and the distance between the top of the vent termination and the underside of the deck is greater than 1 foot.</p> <p>Products of combustion from these vents will dissipate in the air safely when located far enough away from building components and systems.</p> <p>A Heat Recovery Ventilator (HRV) draws fresh air from outside through a mechanical air intake, distributes it through ductwork. It also removes and exhausts stale air from inside the building.</p>	
	Failure scenario(s)	When the gas appliances were operating, the exhaust was drawn into the HRV air intake, and the products of combustion in the exhaust contained carbon monoxide, which entered the house.	
	Facts and evidence	Three gas appliances were installed and vented out the side of the house when the house was built. An HRV was also vented out the same side of the house. The HRV air intake is located 13 feet from the nearest gas appliance exhaust vent. The required clearances between the exhaust vents and HRV intake exceeded minimum code requirement.	

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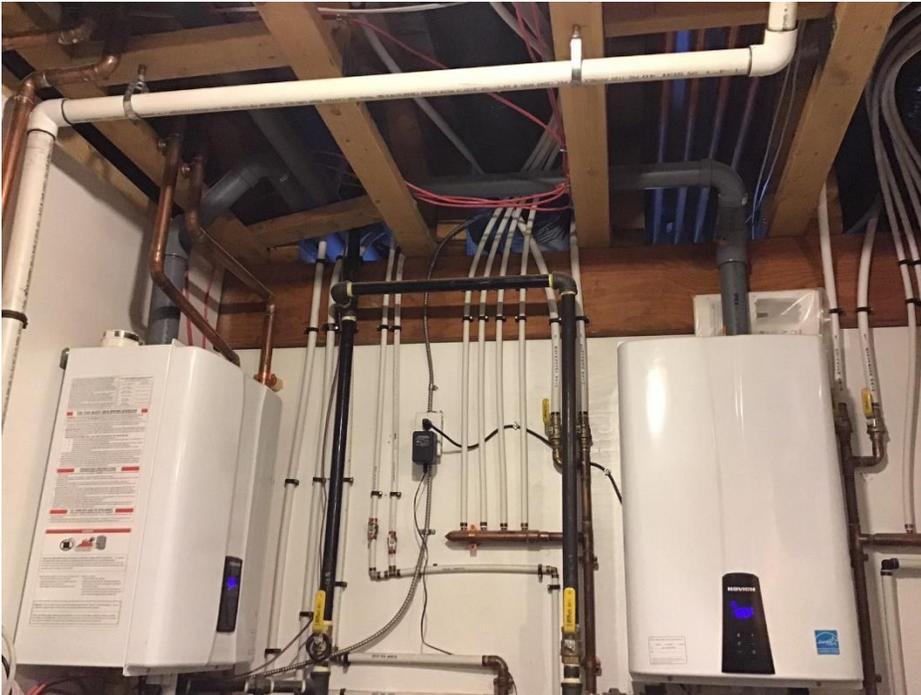
	<p>At a later date, a large deck was built on the side of the house, over top of where the gas appliance vents are located. The clearance to the underside of the deck to the vents was less than 1 foot and between the deck joists. The HRV intake vent is also located under the deck.</p> <p>The gas appliance vents were not extended when the deck was built. The occupants of the house stated they were alerted by the house carbon monoxide detector at approximately 0230 hours. The fire department measured 45 ppm CO in the boiler room, and 24 ppm CO on the main floor of the house.</p> <p>A gas contractor determined there were no leaks in the gas appliance venting systems inside the house.</p> <p>Once carbon monoxide readings in the house returned to 0 ppm, the gas appliances vents were extended out to the edge of the deck and were turned back on. The HRV was turned back on, and no carbon monoxide was detected inside the house.</p>
<p>Causes and contributing factors</p>	<p>It is highly likely that the deck over top of the gas appliance exhaust vents prevented the exhaust gases from dissipating outside. Exhaust was trapped under the deck, and the HRV air intake drew the exhaust inside, which distributed exhaust with carbon monoxide throughout the house.</p>



13 feet clearance between closest exhaust vent and HRV intake



Appliance exhaust vents. Temporary extensions added



Two, of three gas appliances



New deck and location of gas appliance vent terminations before and after vents extended.



Grey CPVC exhaust vents, Black ABS temporary vent extensions