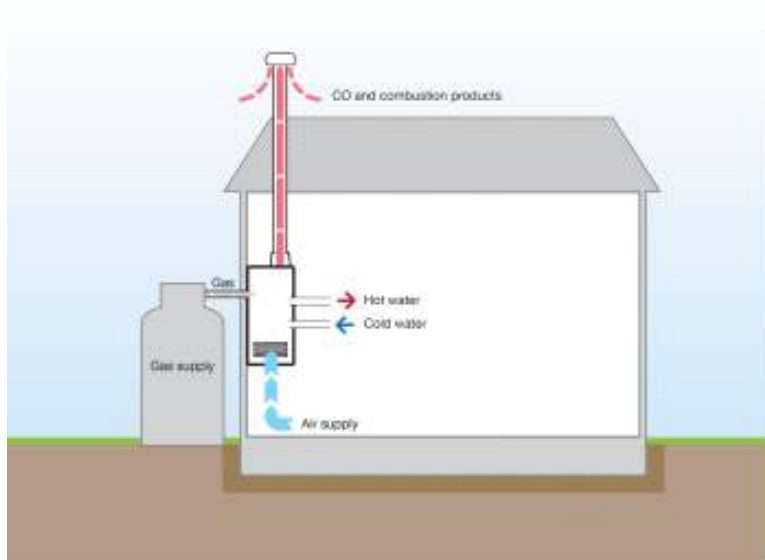


## Incident Summary (5613597)

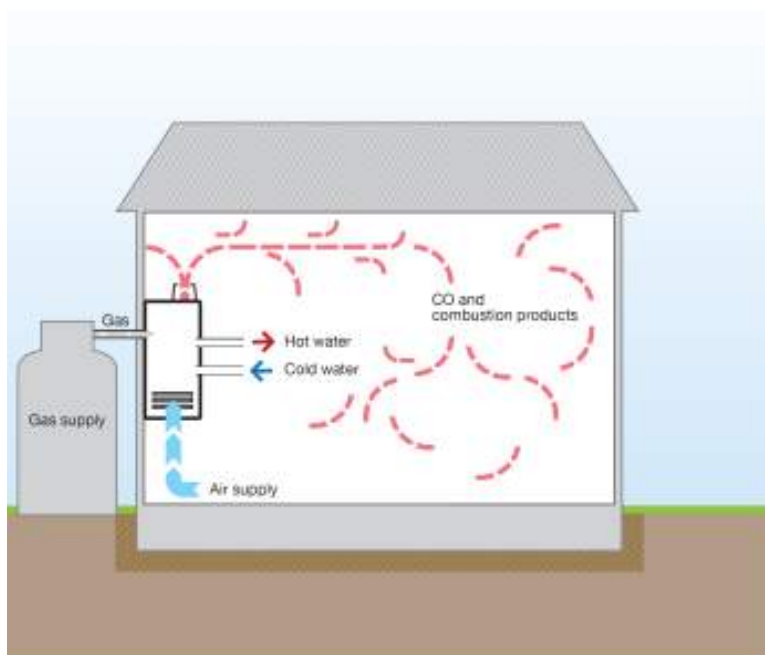
SUPPORTING INFORMATION	Incident Date		March 24, 2017	
	Location		Ashcroft, BC	
	Regulated industry sector		Gas	
	Impact	Injury	Qty injuries	4
			Injury description	Four family members deceased: 1 male, 1 female, and 2 male children. Family dog also deceased.
			Injury rating	Fatal (suspected carbon monoxide exposure)
	Damage		Damage description	N/A
			Damage rating	None.
	Incident rating		Severe.	
	Incident overview		After responding to a 'request for wellbeing check' at a home, RCMP officers discovered that four occupants of a home were deceased. RCMP requested that BCSA investigate the residence for carbon monoxide exposure.	
INVESTIGATION CONCLUSIONS	Site, system and components		<p>The water heater is tankless, meaning cold water is heated instantly by a high output propane burner when a hot tap is opened. The products of combustion (vent gases) are designed to be vented safely to the outdoors through an approved vent system.</p> <p>An approved vent system was not installed and attached to this water heater.</p>	
	Failure scenario(s)		<p>The water heater was installed inside the residence without a vent system attached. As a result all vent gases were released within the occupied living space of the home. The water heater's heat exchanger had become partly blocked with soot. The blockage of the heat exchanger limited the vent gases from moving freely away from the combustion chamber resulting in incomplete combustion at the burner. This produced a carbonizing flame and vent gases high in carbon monoxide.</p> <p>The home owners had returned to the residence after being away on vacation and found the kitchen sink drain was frozen. In an attempt to thaw the ice blockage, a garden hose was attached to the bathtub faucet. The outlet of the garden hose was then pushed up the outdoor exposed kitchen drain pipe, the hot water was then turned on, and ran continuously. The extended operation of the water heater led to the hazardous levels of carbon monoxide inside the home.</p>	
	Facts and evidence		<p>The make and model of the tankless water heater was not confirmed. There were no labels, rating plates or approval marks found on the water heater. The cover for the water heater was missing and could not be found. The physical characteristics of the water heater indicate the manufacture is likely Bosch, model WR400. Visual inspection of the water heater found the heat exchanger was approximately 50% restricted. The blockage of the heat exchanger limited the vent gases from moving away from the combustion chamber resulting in incomplete combustion at the burner producing toxic carbon monoxide. In an attempt to thaw the ice blockage a garden hose was attached to the bathtub faucet. The outlet of the garden hose was then pushed up the outdoor exposed kitchen drain pipe, the hot water was then turned on,</p>	

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	<p>and ran continuously. The fact the appliance was not vented to the outdoors, meant that toxic gases were released to the occupied space while the water heater burner was operational. The Ashcroft Fire Chief tested the vent gas products during the water heater operation. Carbon monoxide gas tested at the appliance vent outlet rapidly climbed to toxic levels exceeding 2000 parts per million.</p>
<p>Causes and contributing factors</p>	<p>The water heater was installed inside the home without a vent system attached, the extended operation of the water heater led to the hazardous levels of carbon monoxide.</p>



Tankless water heater properly vented.



Tankless water heater not properly vented.



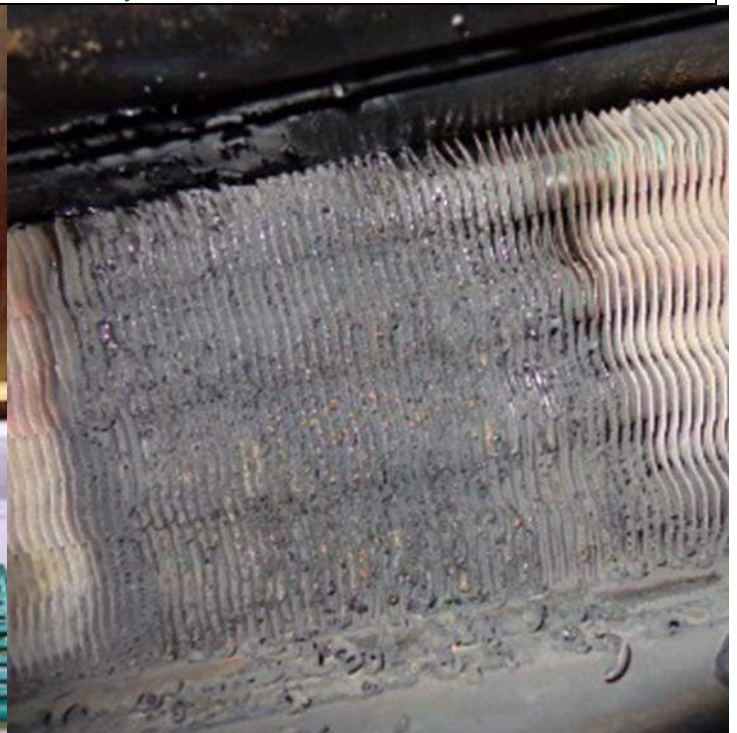
Side view of home



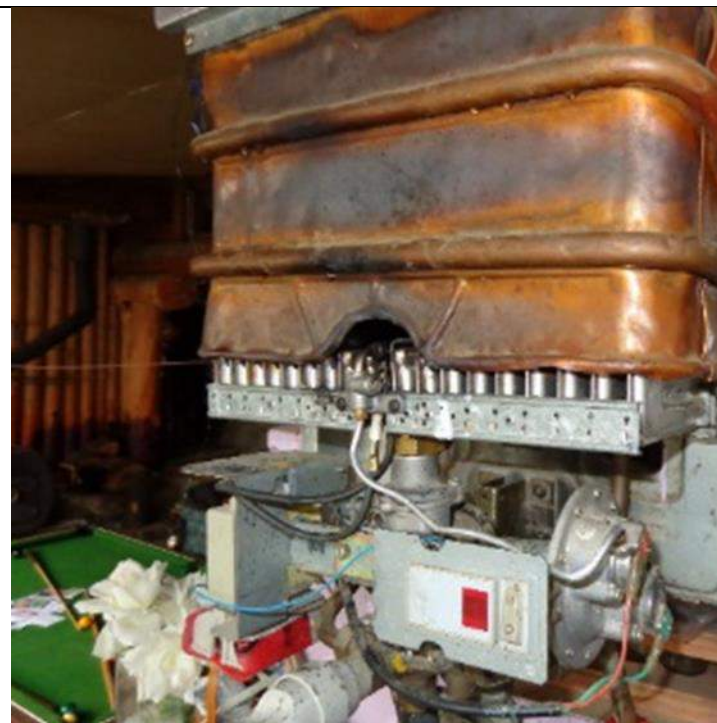
Front view of home



Vent outlet of water heater note soot on ceiling



Soot blocked middle section of water heater heat exchanger



*water heater burner and controls section*



*Garden hose attached to bathtub faucet hot tap turned on.*



*100 pound propane tank attached to water heater*