Incident Summary #II-1512599-2023 (#32334) (FINAL)

SUPPORTING INFORMATION	Incident Date		February 22, 2023
	Location		Chilliwack
	Regulated industry sector		Gas - Natural gas system
	Impact – Injury	Qty injuries	4
		Injury description	Carbon monoxide exposure with symptoms including headache and nausea
		Injury rating	Moderate
	Impact – Damage	Damage description	The glass panels that were part of the heater had broken edges where portions of the glass were missing creating holes where the products of combustion could escape into the occupied space.
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		Two adults and two children were exposed to carbon monoxide in a rental home. An older model free standing natural gas fireplace was incorrectly installed in a home as a fireplace insert inside an existing masonry fireplace. The fireplace produced carbon monoxide that migrated into the home.
INVESTIGATION CONCLUSIONS	Site, system and components		The gas fireplace was constructed as a free-standing fireplace with a 3-sided glass window. It was not designed as a fireplace insert. The manufacturer's instructions require the venting arrangement to have a minimum 3-foot straight section of 5” C-vent and to rise vertically to connect to straight sections of B-vent only.
	Failure scenario(s)		The property owner had purchased the home approximately 1 month before renting it out. The property owner did not have the home inspected by a home inspector before purchase. A free-standing natural gas fireplace was incorrectly installed inside of an existing wood burning fireplace as an insert. It was vented incorrectly without following the manufacturers venting installation instructions, which resulted in poor draft upon startup. The fireplace had 3 glass windows which did not seal due to breaks in the glass at the edges which left open holes allowing products of combustion to leak into the occupied space. There were no carbon monoxide detectors installed in the home. The 4 occupants had moved into the rental property 3 days prior to the incident. The combination of poor draft and open holes to the combustion area resulted in products of combustion entering the occupied space of the dwelling and exposing the 4 occupants to carbon monoxide.

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Facts and evidence	Site observations: The front glass panel had been damaged in several locations resulting in openings to the combustion compartment where products of combustion could escape into the occupied space of the home instead of being expelled to the outdoors. Instead of replacing the damaged glass, the damaged areas were covered over with aluminum trim that was not part of the original design of the fireplace. The venting from the gas fireplace had a short, approximately 2' section of C vent rising vertically before it transitioned into a section of chimney liner venting material to bend around the flue and turn 90 degrees from the firebox to enter the flue where the liner again turned 90 degrees to terminate at the top of the chimney with a vent cap. The vent cap was restricted on two sides by the masonry chimney decorative arch as a top cap. The venting arrangement did not comply with the manufacturers venting design and was most likely a restriction to allow a proper draft from the appliance. There were no carbon monoxide detectors found in the home. Interview statements: • The fireplace cycled on and off from a thermostat in the living room and would operate unsupervised day and night. • The property owner had purchased the property approximately 1 month before deciding to rent it out. The property owner did not have the home inspected by a home inspector before purchase. • A gas utility technician attended the residence and inspected the fireplace. With the fireplace operating, 300 parts per million (ppm) of carbon monoxide was measured in front of the fireplace and a strong odor from the fireplace was noticeable right away. Fireplace installation instructions: The manufacturer's instructions include: "*Exhaust gases are expelled to the outside of the building by using a combination 5-inch single wall/5-inch B-Type vent system. Model GS-4000* ***MUST*** *use this combination vent system – NO other vent system may be used".* The instructions describe to use straight sections of single wall pipe for a minimum of 3 feet and then can transition to sections of double wall B vent pipe. The venting system installed did not comply with the manufacturer's instructions.
Causes and contributing factors	It's highly likely the cause of the incident was the incorrect installation, repair, and operation of the gas fireplace. The combination of open holes to the combustion compartment of the fireplace with the venting installation that did not comply with the manufacturer's installation instructions and the B149.1 Natural Gas and Propane Installation Code may have affected the draft required to remove products of combustion and most likely contributed to carbon monoxide being released inside the home. A contributing factor was that no carbon monoxide detectors were installed in the home.

Photo 1 - The fireplace in operation in a realtor listing. The home was purchased approximately 1 month prior to the tenants moving in. This photo shows the aluminum trim pieces on the right side and the left side of the glass that were installed by previous owner to cover up the holes in the glass. (*Images taken from a public domain website*)

Photo 2 - The fireplace after the incident. A gas utility technician had removed the aluminum trim on the corners of the glass exposing the holes in the glass on the sides.

Photo 3 - Front glass panel with damage to glass on top left side.

Photo 4 - Front glass panel with damage to glass on top right corner.

Photo 5 - Front glass panel with damage to glass at bottom right corner.

Photo 6 - Aluminum trim that was in place covering the damaged glass. This trim piece is not from the manufacturer.

Photo 7 - The back of the left side aluminum trim piece showing discoloration from products of combustion from the damaged glass.

Photo 8 - The back of the right-side aluminum trim piece showing discoloration from products of combustion from the damaged glass.

Photo 9 - Stainless steel chimney liner connected to the fireplace pulled through the existing masonry chimney. The installation manual does not describe using a chimney liner as part of the installation.

Photo 10 - The top arch of the existing masonry chimney is a restriction to the vent cap for the fireplace venting.