

## Incident Summary #II-1401094-2022 (#28618) (FINAL)

SUPPORTING INFORMATION	Incident Date		July 10, 2022	
	Location		Toad River, Northern Rockies Regional Municipality	
	Regulated industry sector		Gas - Propane system	
	Impact	Injury	Qty injuries	0
			Injury description	N/A
			Injury rating	None
		Damage	Damage description	A building with a propane gas supply and propane fired appliances in the crawl space had an explosion. Damage included an explosion in the crawl space and a fire at one of the hot water heaters. Fire and heat damage to all surfaces in the crawlspace.
			Damage rating	Major
Incident rating		Major		
Incident overview		A polyethylene underground propane line at a four-unit motel accommodation had a gas leak at a connection. The leak occurred underground in close proximity to the building. Gas accumulated in the ground and migrated into the building crawlspace where the gas appliances are located and contacted a source of ignition causing an explosion.		
INVESTIGATION CONCLUSIONS	Site, system and components		<p>Polyethylene plastic gas lines carry gas underground in a vapor state from a remote propane tank or natural gas meter to a location outside of buildings.</p> <p>Polyethylene gas pipe transitions to a steel riser pipe which brings the gas line above ground level. Steel or other hard pipe then carries gas into a building to the gas appliances.</p> <p>The transition from polyethylene tube to the steel riser pipe can be accomplished with a fitting that the polyethylene tubing is inserted into. The fitting contains a seal and compression type action to grip the polyethylene so it can not be pulled out.</p> <p>The end of the polyethylene tube must be prepared in accordance with the tube and fitting manufacturers instructions prior to being inserted into the fitting to ensure a gas tight connection. Once the tubing is connected to the risers at each end, a leak test is to be completed to ensure there are no leaks.</p> <p>The gas line to the hot water tanks in the building use a two-piece quarter-turn ball type shutoff valves upstream of the appliances. The valve body is made up of two separate pieces threaded together containing a spherical ball and seals. The valves allow gas flow from fully open to fully closed with a ¼ turn of the handle. When the handle is in line with the valve, it is open allowing flow, and when the handle is perpendicular to the valve it is closed stopping flow.</p>	

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Failure scenario(s)	<p>An unqualified and unlicensed individual installed approximately 20 feet of polyethylene gas tubing underground from a 1000-gallon propane storage tank to the outside of the 4-unit accommodation building. The individual was not trained to install polyethylene gas tubing or join it with fittings.</p> <p>The gas line transitioned to a steel riser underground outside the side of the building. The transition fitting, installed by the individual, had a significant gas leak at a pressure of 10 pounds per square inch (psi). The propane gas, which is heavier than air, traveled through porous gravel and dirt ground and migrated into the building and settling in the low crawlspace where the gas appliances were located. The flammable gas-air mixture accumulated and contacted a source of ignition which resulted in an explosion. The explosion separated a two-piece brass valve on the gas line to a hot water tank. The open gas line allowed gas to flow uncontrolled which was ignited causing a small fire.</p>
Facts and evidence	<p><b>Interview statements</b></p> <ul style="list-style-type: none"> <li>The individual who installed the gas line stated that they where not qualified to install the gas line and did not hold a certification or have training on how to install polyethylene gas lines.</li> </ul> <p><b>Site observations</b></p> <ul style="list-style-type: none"> <li>The ground around the building was permeable gravel and dirt.</li> <li>The concrete foundation for the building did not extend below the lowest point of the crawlspace.</li> <li>The hot water heater burner, an ignition source, is within a few inches of the crawlspace floor.</li> <li>The gas ball valve to one of the hot water tanks was found separated and in the open position.</li> <li>Flame patterns and fire damage were observed that indicate the escaping gas from the ball valve was ignited causing a small fire.</li> </ul> <p><b>Testing</b></p> <p>The polyethylene tubing and risers were exposed and investigated by a licensed gas contractor after the incident occurred. The gas piping risers at each end were pressure tested. A significant leak was found at the downstream riser transition fitting (<a href="#">Image 9 – Gas Leak Video</a>).</p>
Causes and contributing factors	<p>It is likely that the leaking underground gas line installed by an unqualified person with an underground leaking connection was the cause of the incident.</p>



Image 1 - Exterior of four-plex accommodation. Red arrow showing the approximate location of the underground gas leak.



Image 2 - 1000 USWG propane tank supply for the four-plex. Piping had been disconnected from the tank after the incident.



Image 3 - Crawlspace under four-plex. Heat damage found on all surfaces in the crawlspace, including melted Styrofoam concrete forms and all wiring, piping, and wood.



Image 4 - Fire damage to Hot Water Heater #1



Image 5 - Hot Water Heater #1. Source of ignition in the four-plex crawl space



Image 6 – Red box showing water heater gas valve piping with part of the two-piece ball valve attached.



Image 7 – Damaged gas ball valve with the handle in the open position.



Image 8 – Red box second part of ball valve showing damaged threads where it had separated.



Image 9 – Leaking coupling on underground gas line exposed after incident.

