Incident Summary #II-1672589-2024 (#44258) (FINAL)

SUPPORTING INFORMATION	Incident Date		February 11, 2024
	Location		Oliver, B.C.
	Regulated industry sector		Gas - Propane system
	Impact – Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Impact – Damage	Damage description	Flame and smoke damage to Recreational Vehicle (RV) which was a complete loss.
		Damage rating	Major
	Incident rating		Major
	Incident overview		A propane refrigerator was being used on the electric setting in an RV continuously for several years. Suddenly it stopped working. Within a day it was switched to propane and worked for a few more days. It then ignited in the RV causing a fire and smoke damage.
INVESTIGATION CONCLUSIONS	Site, system and components		The sealed system of an RV refrigerator holds: • Water • Liquid ammonia • Hydrogen gas A propane flame heats the water and ammonia to its boiling point in what is called the generator. The gaseous ammonia then rises into a condensing chamber where it cools and returns to a liquid state creating the cooling action of the refrigerator. The RV refrigerator can be operated using propane fuel or they also have an electrical element which can provide heat to facilitate the flow of refrigerant when the RV is in use, when connected to a power source. The selection of the refrigerator either operating on propane or electricity can be selected using a switch inside the RV.
	Failure scenario(s)		The propane refrigerator in the RV was set to electrical and ran effectively for several years. One day the refrigerator stopped working on the electrical setting, so the owner switched the refrigerator over to operate on propane, where it continued to work without issue for several days. A few days later the refrigerator again stopped working but this time on propane. The 120v wiring was routed up against the combustion chamber for the propane burner. When the burner was operating the heat from the combustion chamber melted through the wire insulation and caused an electrical arc that created a hole in the combustion chamber wall. When the propane burner was operating, the hot flue gasses exited the hole and started a fire on the combustible material of the RV wall. Later that day a neighbour saw the side of the RV was on fire, they alerted the owner who evacuated immediately.

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Facts and evidence	Site observations • A hole was found in the combustion chamber of the refrigerator that correlates with the beginning of the flame paths in the wall. • A 120v wire was found touching exactly where the hole in the combustion chamber was located. • Signs of arcing were found on the wire almost exactly where it was in contact with the combustion chamber of the furnace. However, it is unclear if this happened after the hole was created or it is what created the hole due to fire damage to the refrigerator, wire, and surrounding area. • Investigation of the RV found two tripped breakers. One breaker served the refrigerator, the other served a plug located on the passenger side of the RV directly below the fridge. • Further investigation found that this outlet was connected to the wire that arced off the combustion chamber. Interview statements • An interview with the owner indicated that they always ran the fridge on electrical ever since they owned it. One day the electrical stopped working and everything thawed in the fridge, so they switched the fridge over to propane where it worked fine for several days. On the day of the incident the fridge once again stopped working and that evening the fire occurred. • During the interview the owner stated that they had never checked if the breaker was tripped and just switched the fridge directly over to propane.
Causes and contributing factors	It is highly probable that wire routing tight to the combustion chamber of the refrigerator over time allowed the heat of the combustion chamber to melt through the loom around the wire and the insulation around the conductor to melt. The bare wire came in contact with the combustion chamber of the fridge, causing an arc which blew a hole in the side of the combustion chamber. The escaping products of combustion eventually lit the side of the RV on fire causing the fire.

Image 1 - Incident scene at time of investigation.

Image 2 - Exterior of the RV where the fire occurred.

Image 3 - Rear of the fridge at time of investigation.

Image 4 - The combustion chamber of the fridge. Note the difference in the colors of the metal due to flame exposure. Flame patterns indicate a “V” style burn with the base of the “V” indicating the origin of the fire.

Image 5 - Hole in the combustion chamber where wire contacted the combustion chamber. Hole was found located directly at the base of the burn pattern.

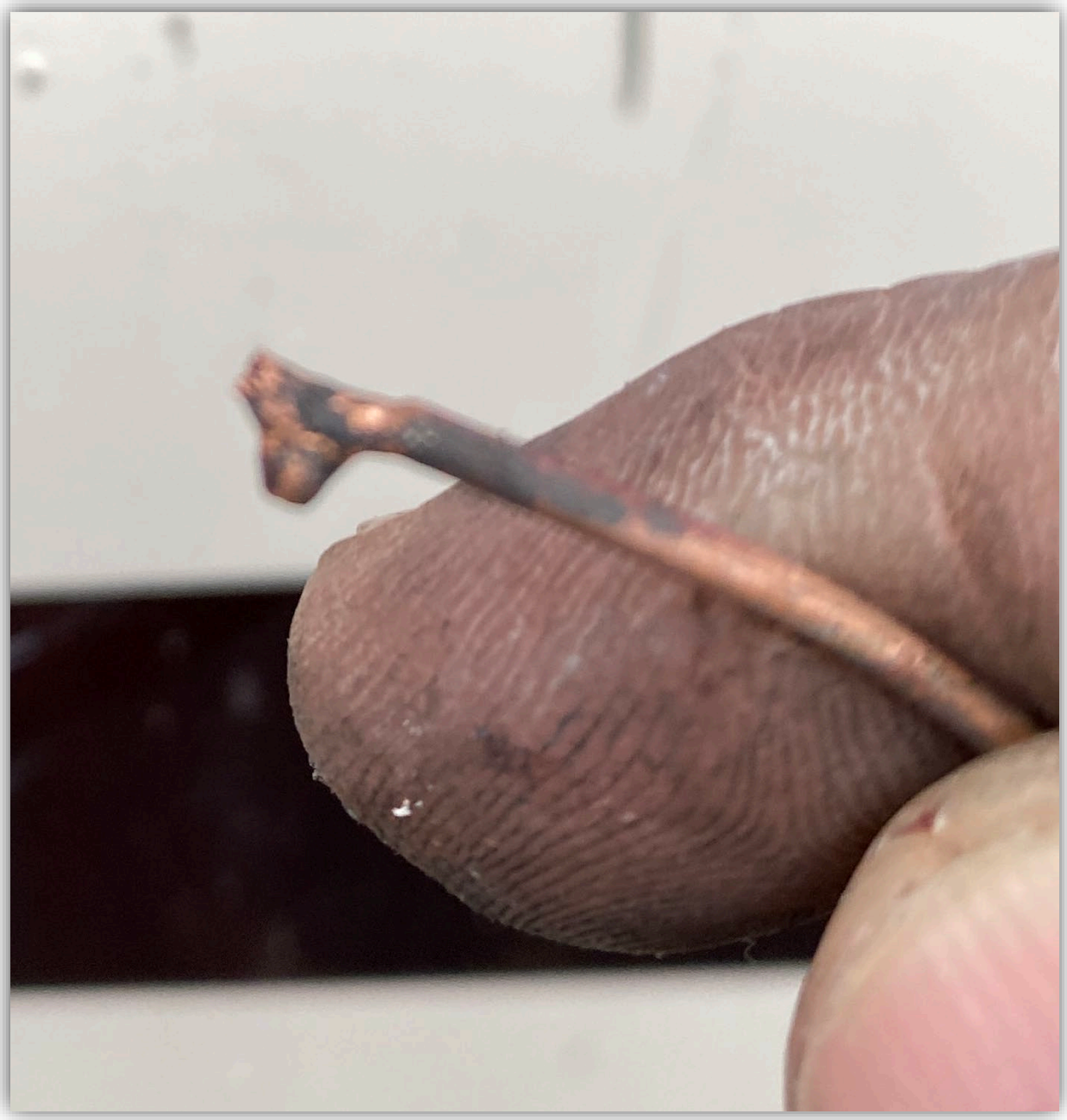

Image 6 - Area on wire that it is believed to have come in contact with combustion chamber. Note deformation from heat caused by arcing.

Image 7 - Exposed insulation of wire that was found to be in contact with the combustion chamber, showing that it was not low voltage wire in contact with the combustion chamber. This shows that the electrical potential would have been enough to cause the hole in the combustion chamber.

Image 8 - Breaker panel showing first, and fourth 15-amp breakers tripped.

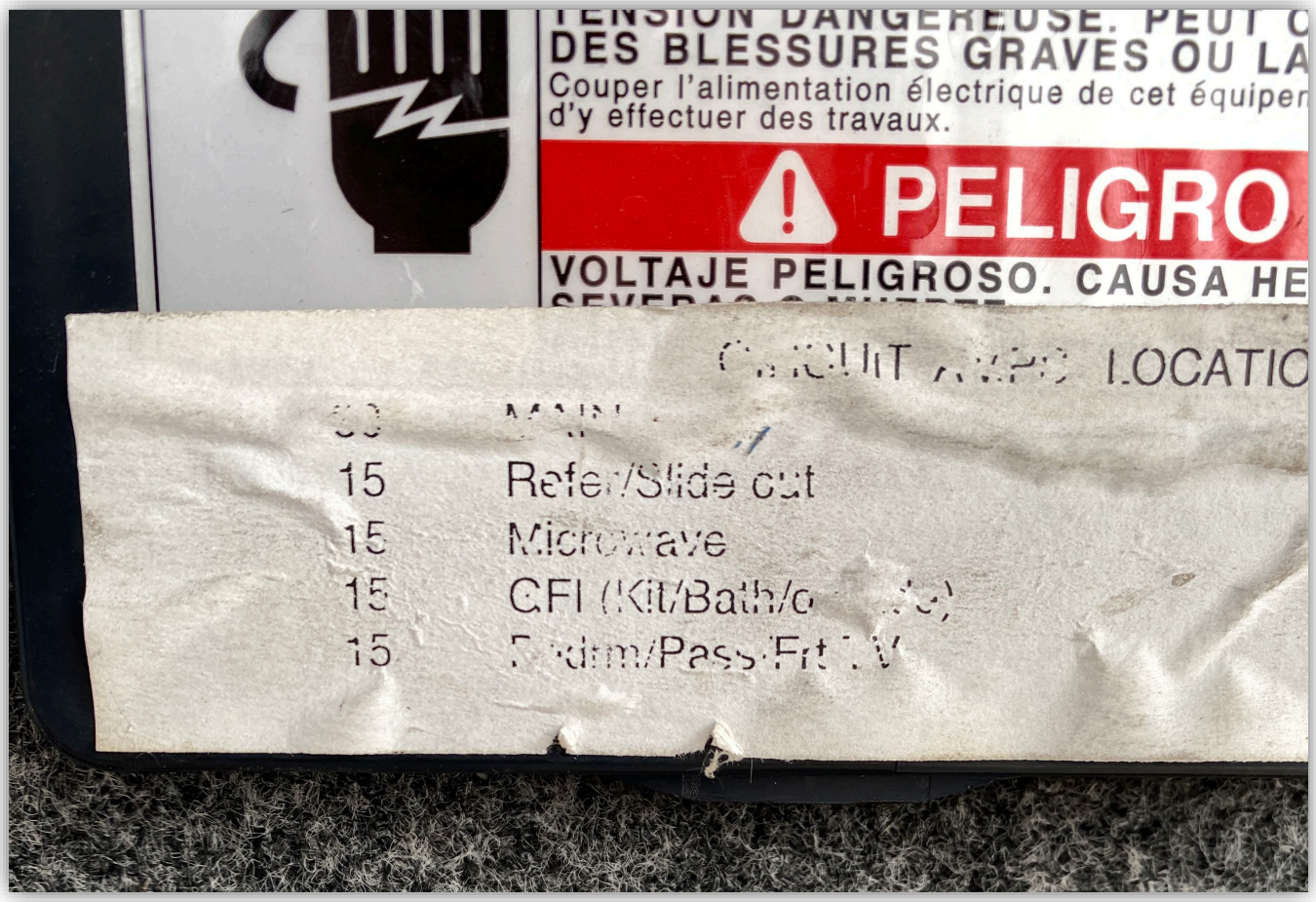

Image 9 - Breaker panel directory indicating the first 15-amp breaker served the fridge, and the fourth 15 amp breaker served the plug which served the wire that came in contact with the combustion chamber of the fridge.