# Incident Summary #II-1799800-2024 (#54589) (FINAL)

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| SUPPORTING INFORMATION | Incident Date | | November 22, 2024 |
| | Location | | Penticton, BC |
| | Regulated industry sector | | Gas - Propane system |
| | Impact – Injury | Qty injuries | 0 |
| | | Injury description | N/A |
| | | Injury rating | None |
| | Impact – Damage | Damage description | No physical damage, however, the incident resulted in a large uncontrolled release of liquid propane. |
| | | Damage rating | Moderate |
| | Incident rating | | Moderate |
| | Incident overview | | While filling a propane cylinder for a customer at a service station, the attendant dropped their filler nozzle resulting in an uncontrolled release of liquid propane. |
| INVESTIGATION CONCLUSIONS | Site, system and components | | When propane cylinders are filled, liquid propane is pumped through the propane piping system into the filler nozzle. Propane dispensers are required to be equipped with an excess flow valve designed to stop the flow of propane should an uncontrolled release of propane occur at any time during the filling process.<br><br>Propane is typically used as a vapour but stored and transferred as a liquid. Liquid propane expands 270 times in volume when it vaporises. The propane cylinder fill system uses a pump to draw liquid propane from a 1000 US Water Gallon (USWG) storage tank, pumping it through a system of piping and valving to a delivery hose and cylinder fill nozzle which transfers the liquid propane into propane cylinders to fill them.<br><br>The liquid propane outlet in the storage tank used to supply liquid to the pump has an internal safety control (ISC) shutoff valve installed in it. The operation of the ISC valve is controlled with a manual actuator located in the cylinder fill cabinet.<br><br>Excess flow valves are safety valves used in propane filling systems. They are meant to stop the flow of fuel and to protect against leaks if a pipe breaks or a hose ruptures. They are piped inline, are directional, and permit flow of liquid or gas in both directions but only protect against excessive flow in one direction. They use a spring-loaded disk that closes when excessive flow is sensed closing off the main flow of fuel (Image 5 and Image 6). The discs have a small hole to allow for pressure to equalize if the valve activates. When pressure is equalized on both sides of the valve the spring will reset the disc allowing for flow again. Excess flow valves come in a variety of flow rates and must be properly sized to protect against the anticipated flow rate of the downstream piping or hoses. The CSA B149.2 propane gas code states that any line utilized for propane flow shall have a flow rate greater than the design flow rate of the excess-flow valve protecting the line. |

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| | The propane cylinder fill hose uses a threaded nozzle and a quick acting valve which allows flow of fuel when the valve handle is raised. When the handle is raised it remains open on its own until it is manually closed.<br>Container refill centers are required to be equipped with a *clearly identified* and readily accessible means to shut off the propane system and electrical power to the propane pump and propane dispenser during an emergency.<br><br>Gas code states that propane shall only be transferred from one container to another by a person who is the holder of a certificate recognized by the authority having jurisdiction. |
| Failure scenario(s) | A propane storage tank and cylinder fill dispenser were installed at the gas station in 2018. The piping system from the propane pump to the cylinder fill nozzle did not have the required, properly sized, excess flow valve installed. There was no dedicated storage receptacle for the cylinder fill nozzle and the nozzle was typically stored on top of the cylinder fill scale when not in use.<br><br>The day of the incident an attendant, who was an employee of the fueling station, went out to the cylinder fill station to fill a customer's 30# propane cylinder. The employee had completed a training course and held a valid propane transfer training certificate for dispensing propane. The employee connected the nozzle and filled up the cylinder. When the cylinder was full, they removed the nozzle from the cylinder.<br><br>The attendant set down the filling nozzle atop the propane piping within the propane dispenser and proceeded to hand the filled propane cylinder to the customer. The propane filling nozzle fell off the piping where it was sitting, the fall resulted in the control valve for the filling nozzle being struck into the open position. There was no excess flow valve in the piping system and liquid propane began to freely flow from the filler nozzle into the atmosphere. The liquid propane began to vaporise creating a plume of propane vapor. The attendant took action to shut down the propane flow to the dispenser however this took quite some time resulting in a sizeable plume of propane vapor spreading across the parking lot with multiple sources of ignition present. The attendant was able to shut down the flow of propane to the dispenser and the propane did not find a source of ignition which resulted in it dissipating to the atmosphere. Should the propane have found a source of ignition a fire could have occurred. If an excess flow valve was in place the propane flow may have stopped quickly without the resulting plume being generated. |
| Facts and evidence | Security camera footage<br>• The attendant was filling a tank and setting down the propane filling nozzle before turning to give the customer their propane cylinder.<br>• The attendant then turns back to the dispenser and the attendant attempted to stop the flow of propane from the tank and were obscured by the plume of propane vapour.<br>• The release occurred for roughly 40 seconds before propane was shut down to the dispenser.<br>• Vehicles were observed idling and driving by near and within the plume of flammable propane vapour. |

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| | Attendant interview statements<br>• They placed the propane nozzle on the piping as there was to nozzle storage receptacle available in the cabinet.<br>• They saw the filling nozzle fall into the ground before the plume emerged.<br><br>Documents<br>• The propane attendant had a valid propane transfer training certificate for dispensing propane.<br><br>Site Observations<br>• A site assessment found no evidence of an excess flow valve installed in the dispenser piping.<br>• There was no nozzle storage receptacle in the cylinder fill cabinet. |
| Causes and contributing factors | The propane cylinder fill nozzle falling opening the quick acting valve caused the propane release.<br><br>Contributing factors to the incident include:<br>• The lack of a storage receptacle for the propane cylinder fill nozzle likely contributed to the nozzle falling to the ground by not providing a safe and secure location to place it when not in use.<br>• The absence of a required properly sized excess flow valve in the propane piping system likely allowed an excessive volume of liquid propane to be released into the atmosphere before the leak was manually shut off by the propane attendant. |

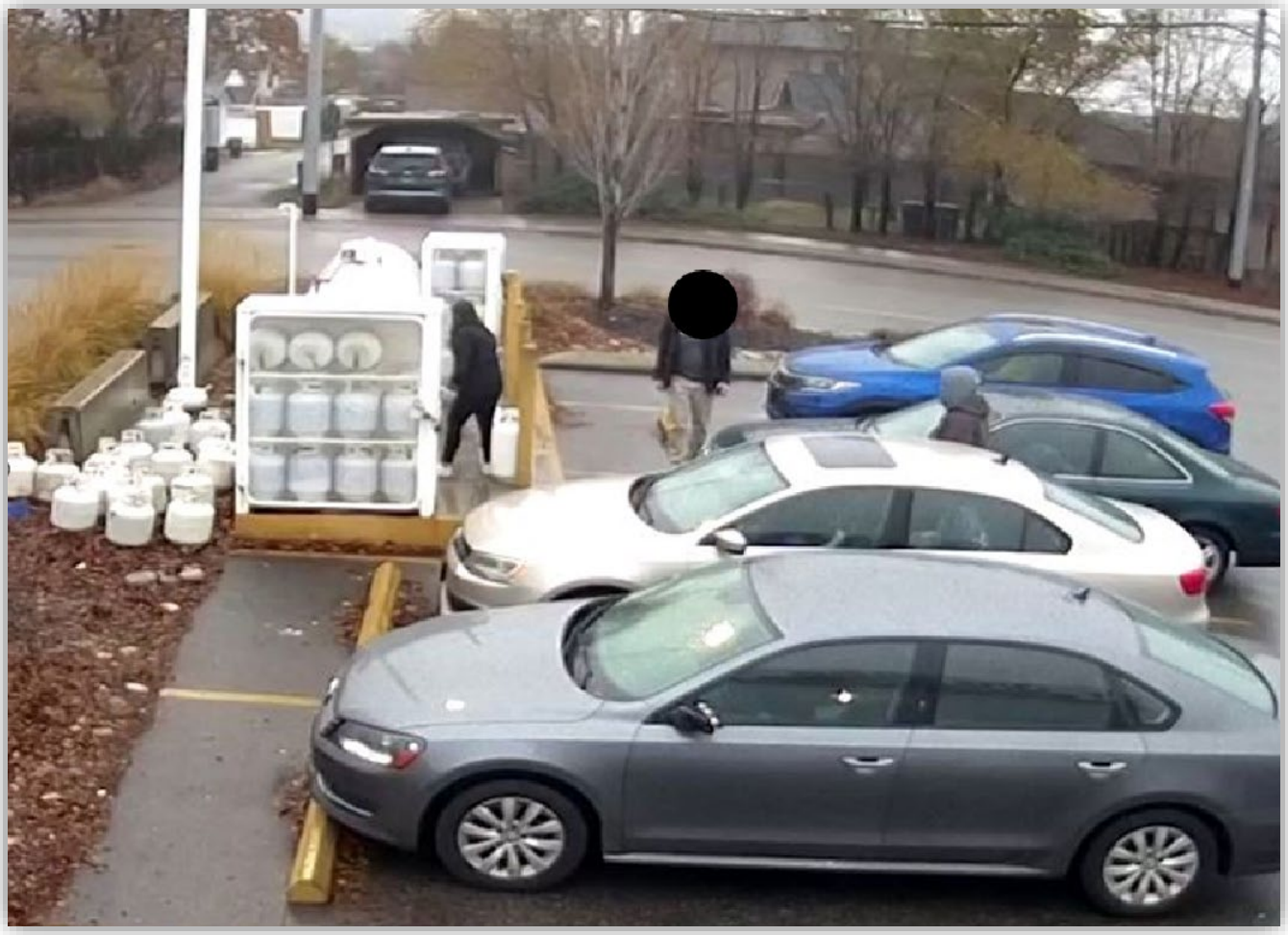

Image 1 - Video still image of incident showing attendant finishing fill of first cylinder.

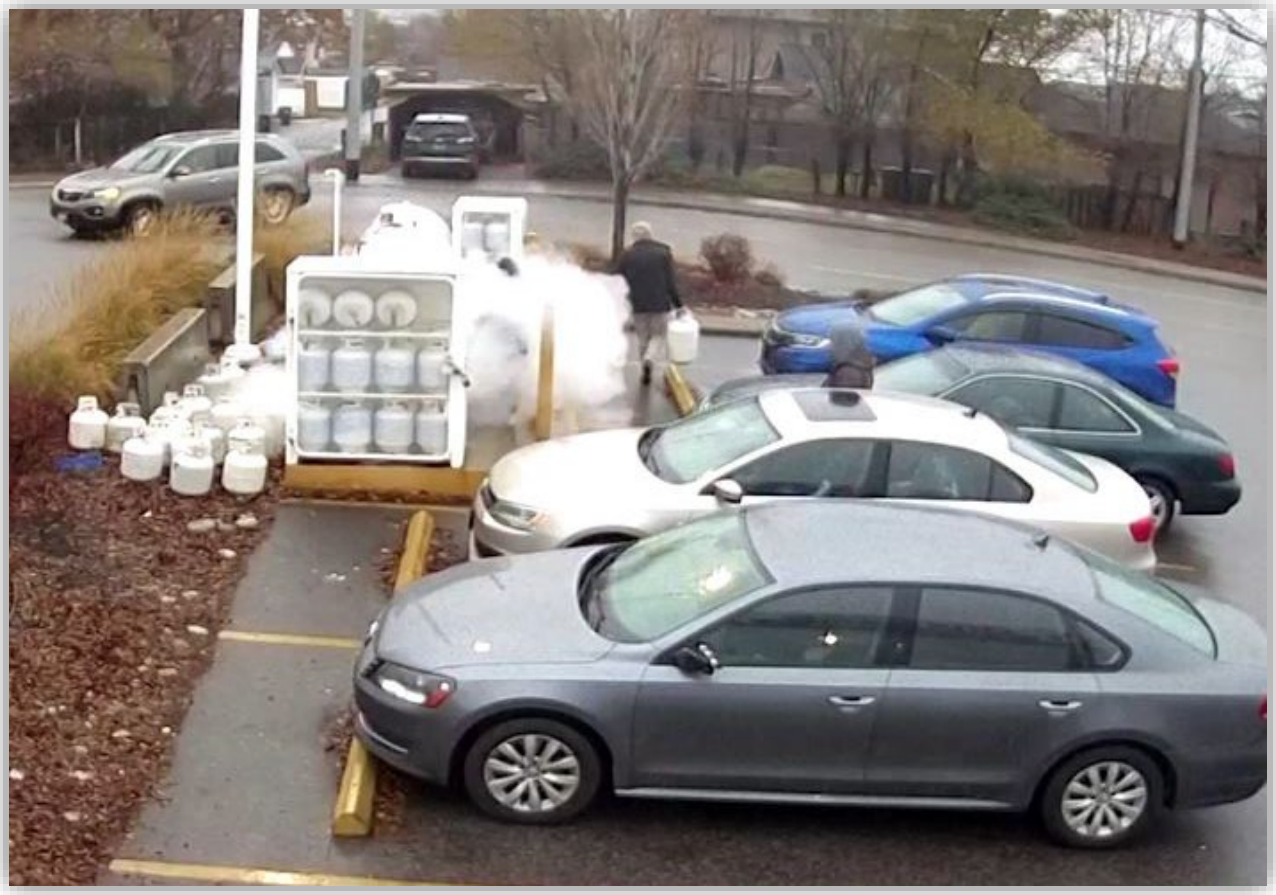

Image 2 - Video still image of incident showing plume beginning to emerge from dispenser.

Image 3 - Video still image of incident showing plume size at halfway point of release (Note grey car idling with lights on).

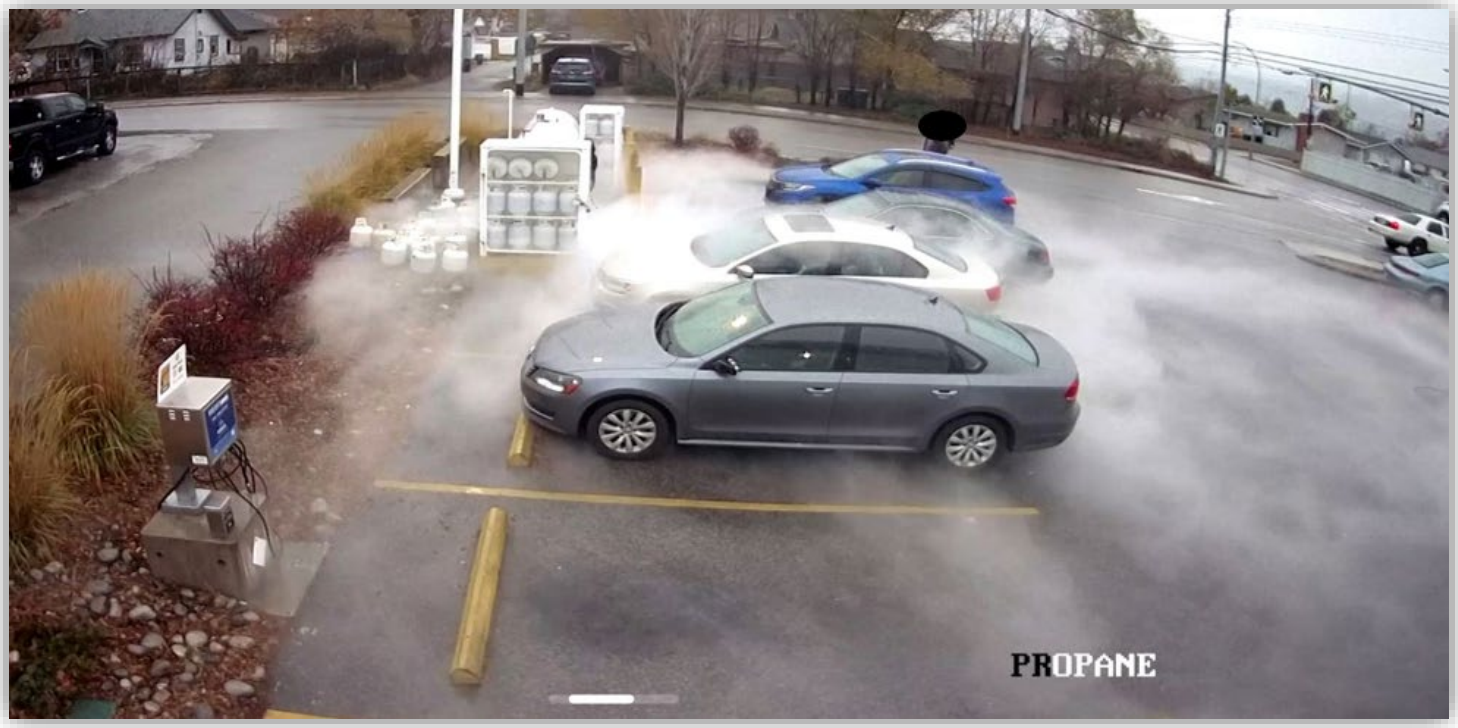


Image 4 - Video still image of incident showing extent of plume just before propane was shut down.

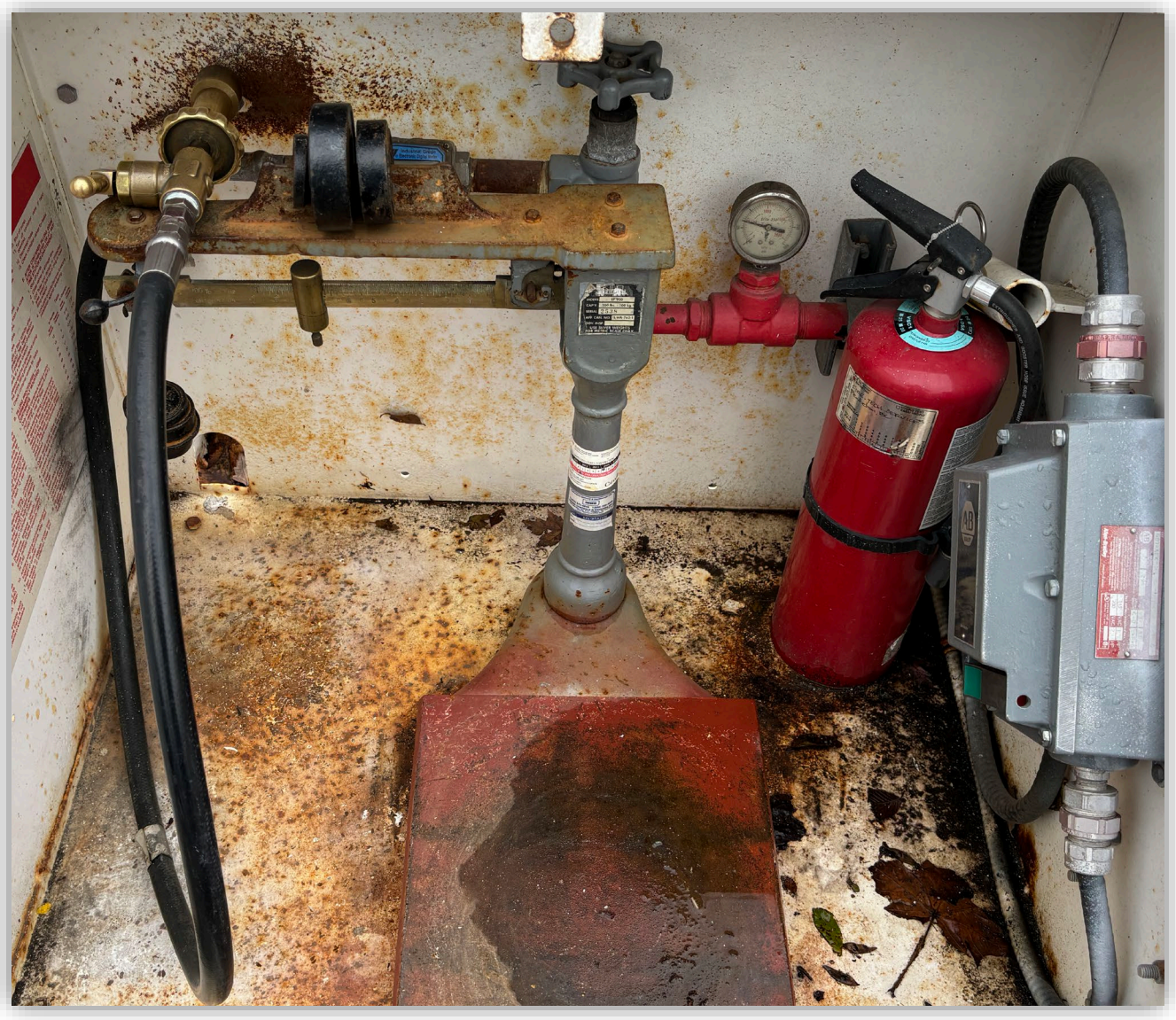

Image 5 - Propane dispenser showing how the cylinder fill nozzle was set down on day of incident.

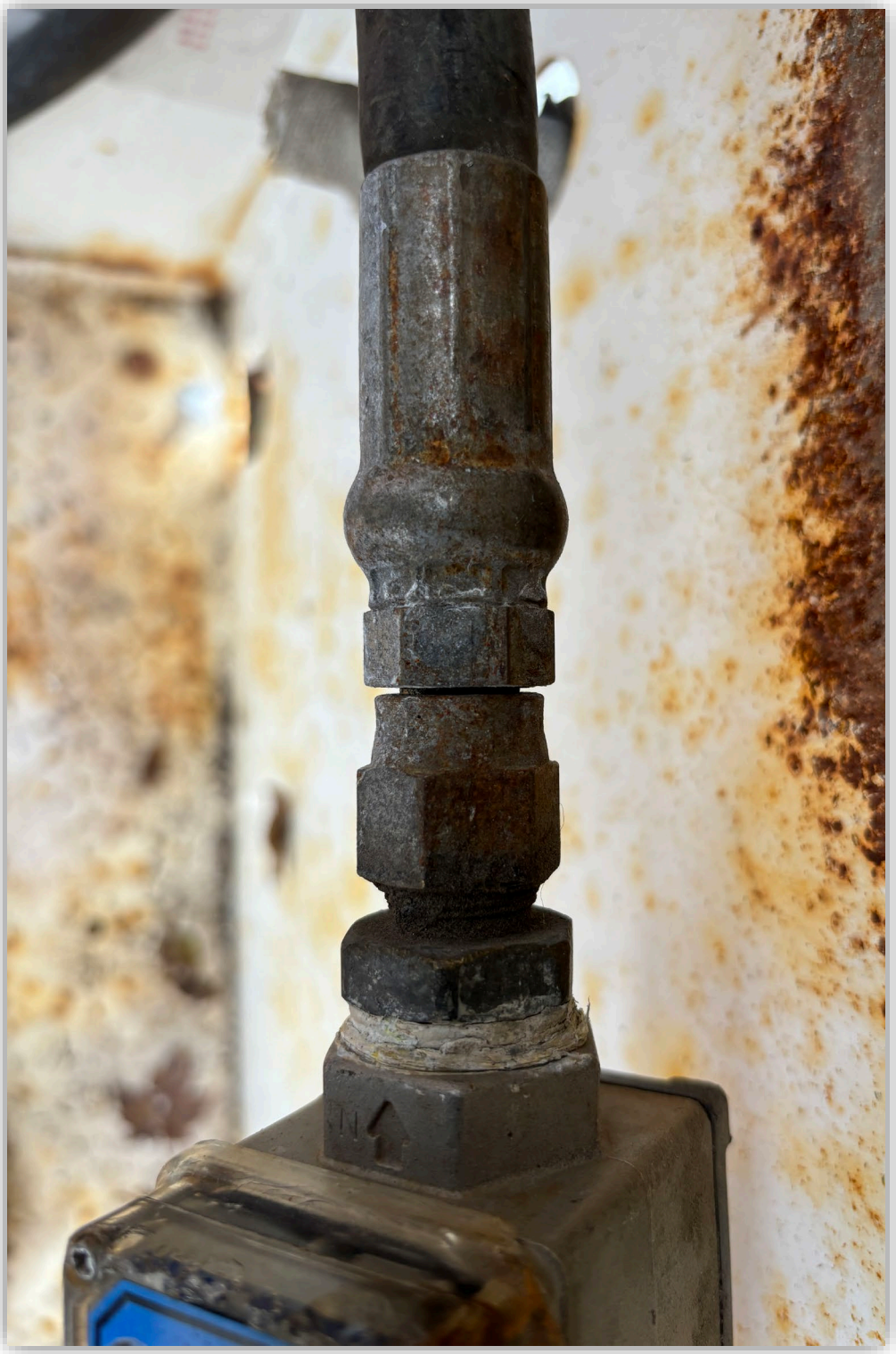

Image 6 - The one end of propane dispensing hose without excess flow valve.

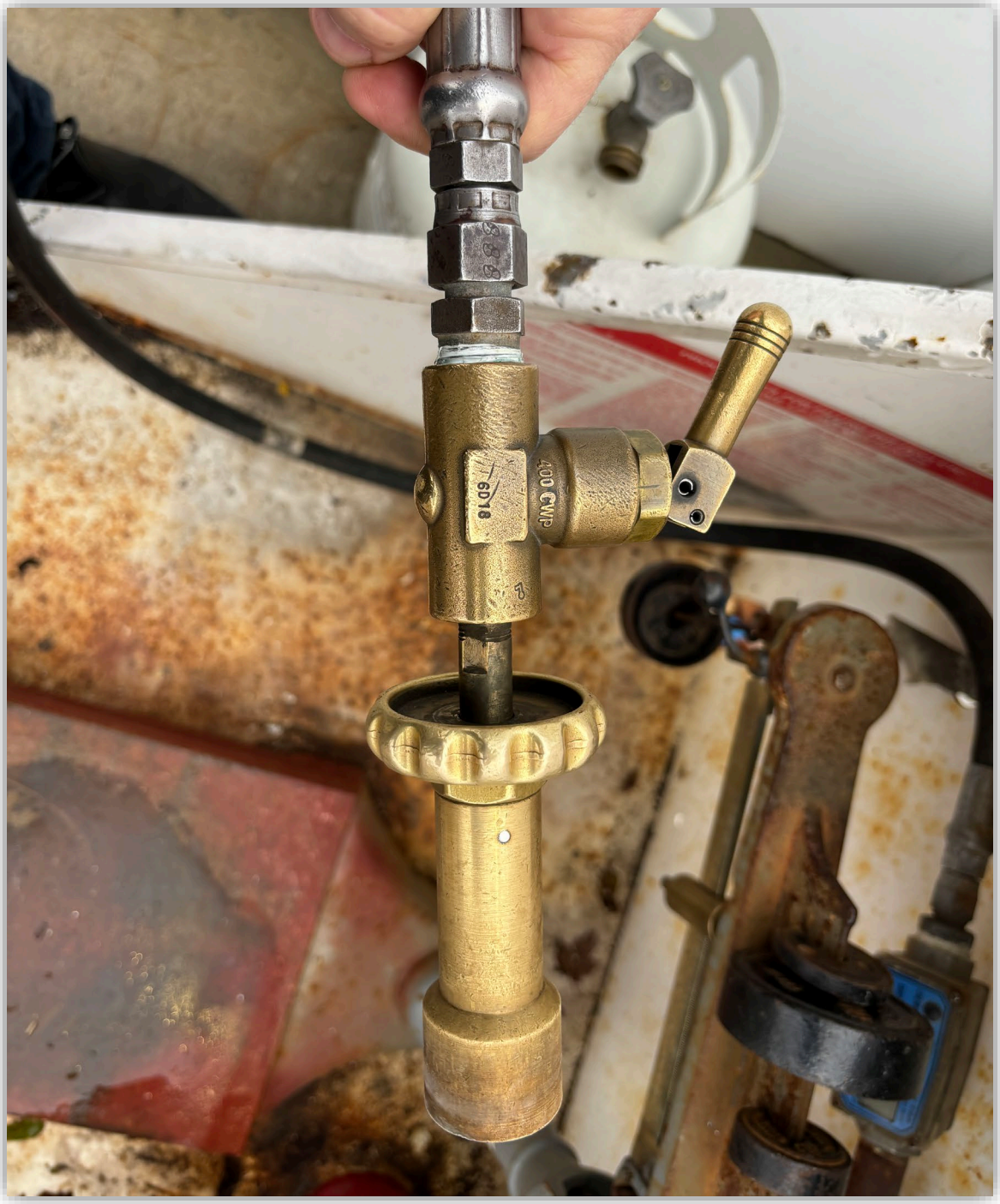


Image 7 - The propane filling nozzle, also without excess flow valve.

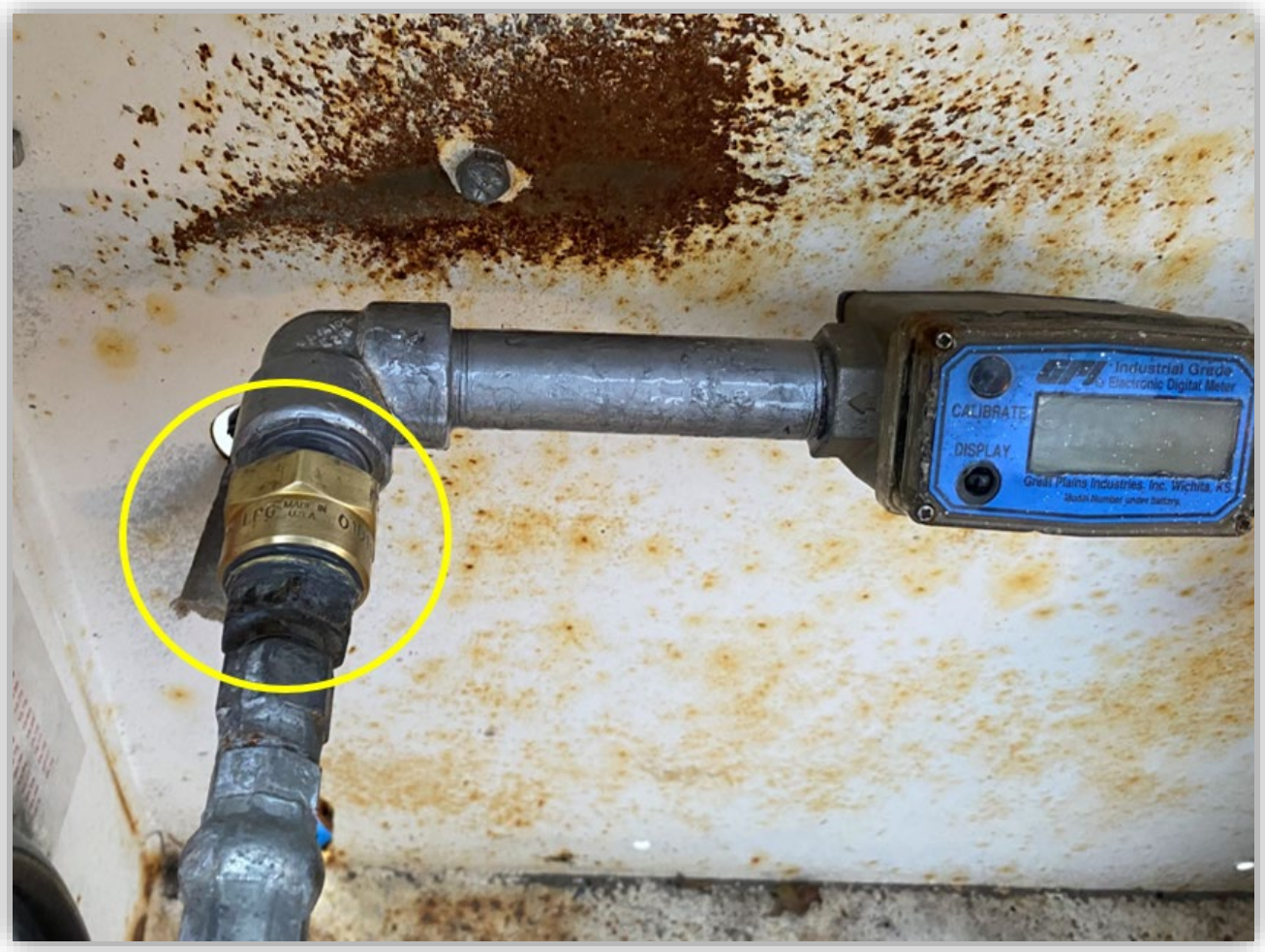


Image 8 - The propane dispenser after non-compliances were corrected. [Circle] Newly installed excess flow valve after the incident.

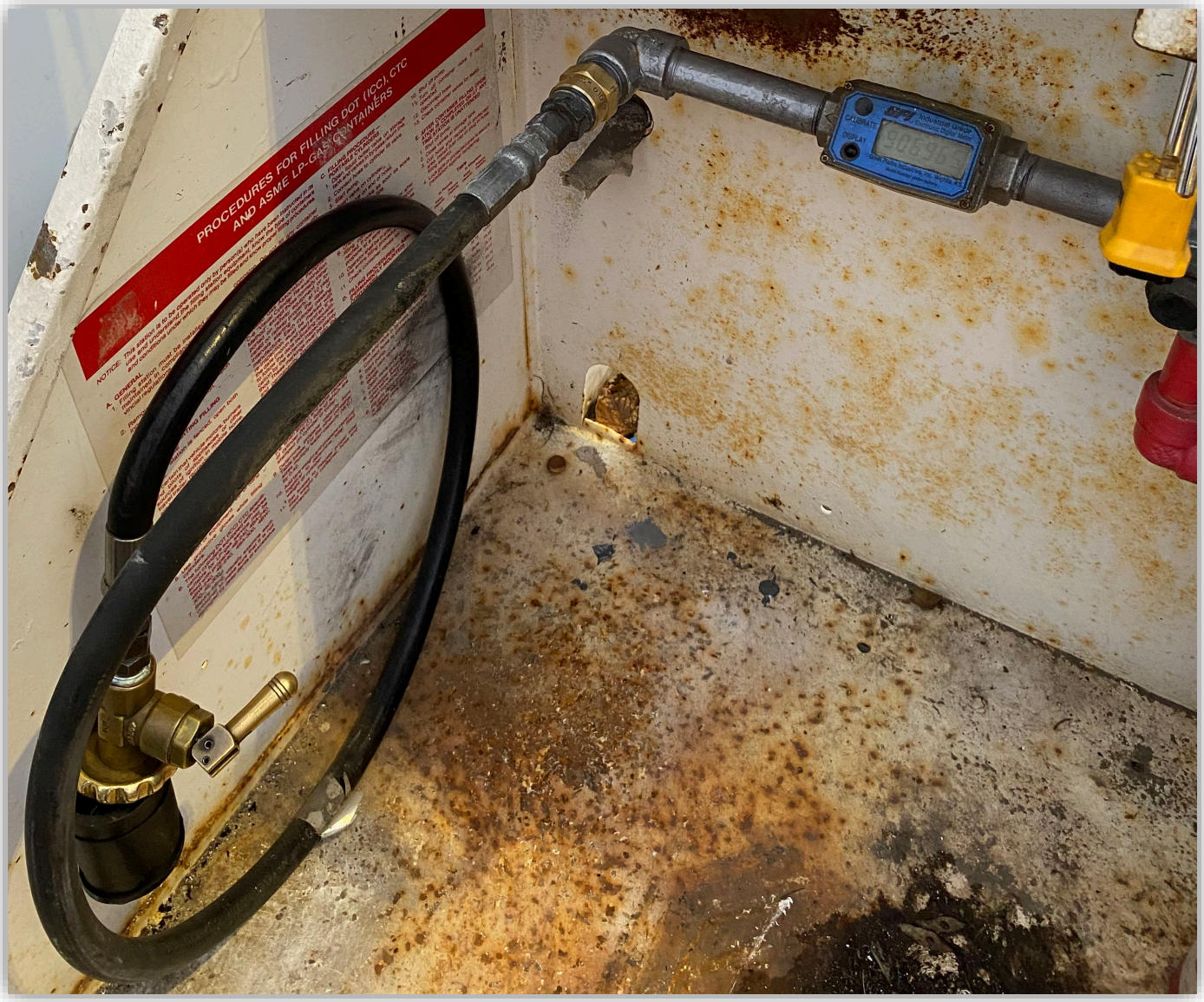


Image 9 - The propane dispenser once non-compliances were corrected, and excess flow valve and nozzle holder were installed.