Incident Summary #II-1024462-2020 (#18292) (FINAL)

SUPPORTING INFORMATION	Incident Date		June 11, 2020
	Location		Prince George
	Regulated industry sector		Gas - Propane system
	Impact – Injury	Qty injuries	0
		Injury description	None
		Injury rating	None
	Impact – Damage	Damage description	A large un-controlled release of liquid propane from cylinder filling hose which caused loss of operation of the dispensing station and exposure to hazardous substance that was meant to be contained.
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		A large un-controlled release of liquid propane occurred at a retail gas station propane cylinder filling location while an attendant was filling multiple propane cylinders.
INVESTIGATION CONCLUSIONS	Site, system and components		The function of a propane dispenser (PIC #2) is to safely transfer liquid propane from the site storage container to smaller approved re-fillable cylinders by a human operator, who can only operate the dispenser if they have a valid propane transfer certificate from an approved training provider. Tanks designed and approved for the storage of liquid propane can be installed in a vertical or horizontal position. Propane liquid flows by gravity, through an Internal Safety Control Valve (ISC) (PIC #4), to an electrically powered pump which then supplies propane via a certified hose to the filling nozzle. The ISC valve, located at the bottom of the tank, is designed to control the flow of liquid propane from the tank. The valve can be manually operated by a cable or chain attached to a handle or lever or remotely operated by a system that utilizes a piston driven by air or nitrogen to operate the valve. The valve will have a thermal disc to rupture in an event of a fire that will trigger the closure of the valve, also it may or may not have a return spring attached to aid in the closing of the valve. The valve must be in the “open” position for propane to flow to the pump and must be “closed” whenever the system is not being used or left unattended. From the ISC there is a some heavy duty piping and fittings that direct the flow of liquid propane to a pump and through the pump to the dispensing nozzles. (PIC #5) Excess-flow valve — a valve designed to close when the liquid or vapour passing through it exceeds a prescribed flow rate as determined by a pressure drop across the valve. Any line utilized for product flow shall have a flow capacity greater than the rated flow of the excess-flow valve protecting the line. The primary purpose of an excess-flow valve shall be to protect against excessive flow when breakage of pipe lines or hose rupture takes place. When referring to breakage or rupture, a clean and complete separation shall be assumed. It is obvious that if the damage is

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	only a crack or if the piping is crushed at the point of failure, the escaping flow will be restricted and sometimes it cannot pass sufficient vapour or liquid to cause the excess-flow valve to close. The Power Switch located in the dispenser cabinet is turned on and off manually by the attendant to activate the ISC to the open, this is done by way of a solenoid valve and it activates the pump to start pumping. A brass cylinder filling nozzle screws into the cylinder service valve outlet. (PIC#1a)The nozzle is operated by a toggle-like lever quick acting valve – lifting up on the lever opens the nozzle and pushing down on the lever closes the nozzle There are different types of filling nozzles for different connections to cylinders. Quick acting valves are designed primarily for use on cylinder charging hoses to provide fast, convenient shut-off and fast opening. These valves must be installed so that flow through the valve is in the opposite direction to that of a conventional globe valve. This allows the inlet flow to assist in closing the valve, and even more important, helps prevent the valve from being forced open by high pump pressure. Propane cylinders of 40 pounds and less are required to be equipped with an Overfill Protection Device (OPD) which prevents the cylinder from being filled beyond 42% of the cylinders water capacity. Since the OPD is a float gauge, it cannot be reliably used for accurately filling a propane cylinder, so a weigh –in/weigh-out method is used with a calibrated weight scale. Some cylinders that are equipped with a fixed liquid level gauge may be filled by a volume method.
Failure scenario(s)	An employee of a local gas station was filling QTY x 5: 20LB propane cylinders (**PIC#3**) After filling the last cylinder the employee felt the hose came loose out of their hands releasing liquid propane un-controlled into the atmosphere causing a white cloud of vapor. Once the employee/attendant felt it was unsafe to enter the area of the released propane he went into retail store to safety and to call the fire department and follow proper emergency protocol. The power to the dispenser was shut down by way of a breaker switch in the electrical panel. This should close the ISC valve and stop pump which in turn would stop the flow of liquid propane from the storage tank. When the power was shut off the liquid propane continued to expand into a vapor at 270times the volume of the liquid causing a white cloud of vapor. The chief of the fire department was the first one on scene and he initiated road closures, aided in the mustering of employees and public to a safe area on the site and planned an safe approach with the firefighters to the dispenser location to stop propane flow. Before the firefighters attempted to access the dispenser location they asked the question on how to shut off propane, the attendant said it is the brass valve on the end of the hose he thinks may have been open.

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	The firefighters we able to clear an area to access the propane cylinder filling hose to shut off the quick acting valve lever to the closed position. The propane then stopped flowing.
Facts and evidence	An un-certified individual was filling propane cylinders. -The gas station employee upon an interview stated that they did not possess a valid propane transfer certificate nor did they receive any approved training. But was in the process through the employer to receive training through an approved provider. They also stated that the training was pushed back because of the Covid19 Pandemic. As per the CSA B149.2-2015 "***Propane Storage and Handling Code"***: **5.2.1** 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***. The Fire department shut off the flow of propane at the quick acting valve on the cylinder filling hose. Liquid propane was released into the atmosphere from the cylinder filling connection for approx. 20min until shut-off. When the power was shut –off to the dispenser the Internal Safety control valve should have seated in the fully closed position. The return spring was not attached to the actuator arm of the ISC valve it had broken off. No excess flow valve was installed on the product flow line.
Causes and contributing factors	It is plausible that a un-certified individual filling propane cylinders was not following the correct procedures for filling propane, thus leading to an accidental release of propane liquid from the dispensing site at a retail gas station. If the individual had been certified through an approved training course, they would have been taught how to use the correct procedure to safely transfer propane to avoid un-controlled release of propane. An excess-flow valve was not installed in the product flow line of the cylinder filling piping thus may have contributed to the length of the un-controlled liquid propane release. The amount of volume of the un-controlled release of liquid propane may have been caused by the ISC valve not seated in the fully closed position due to the age of the valve and a broken return spring not attached to the actuating lever aiding in the full closure of the valve. (PIC #4)

The BLUE arrow above indicating a cylinder being filled with the quick acting shut-off in the open position.

PIC#1 (b)

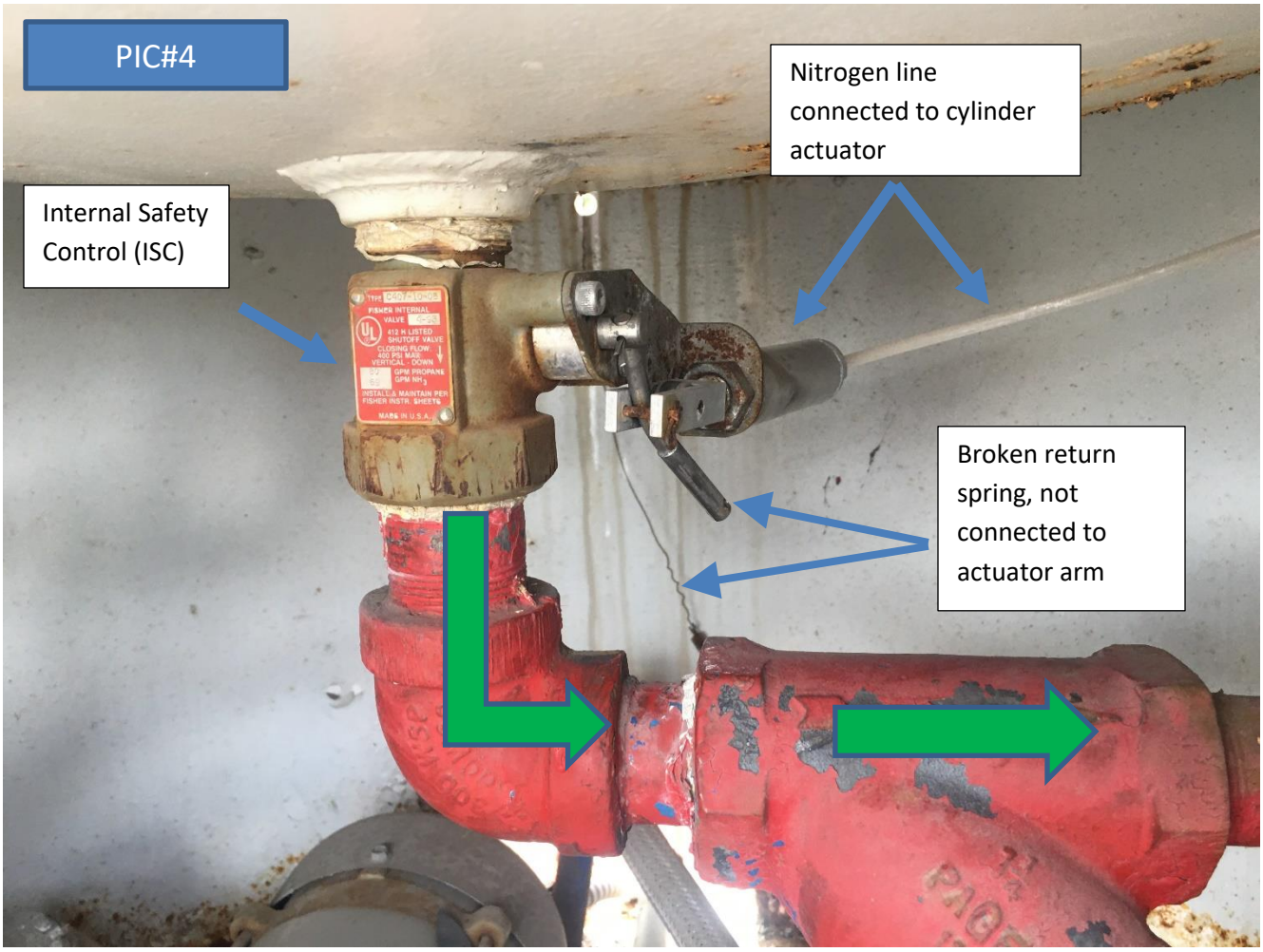
The lever on the quick acting shut-off valve in closed position.

Propane Dispenser

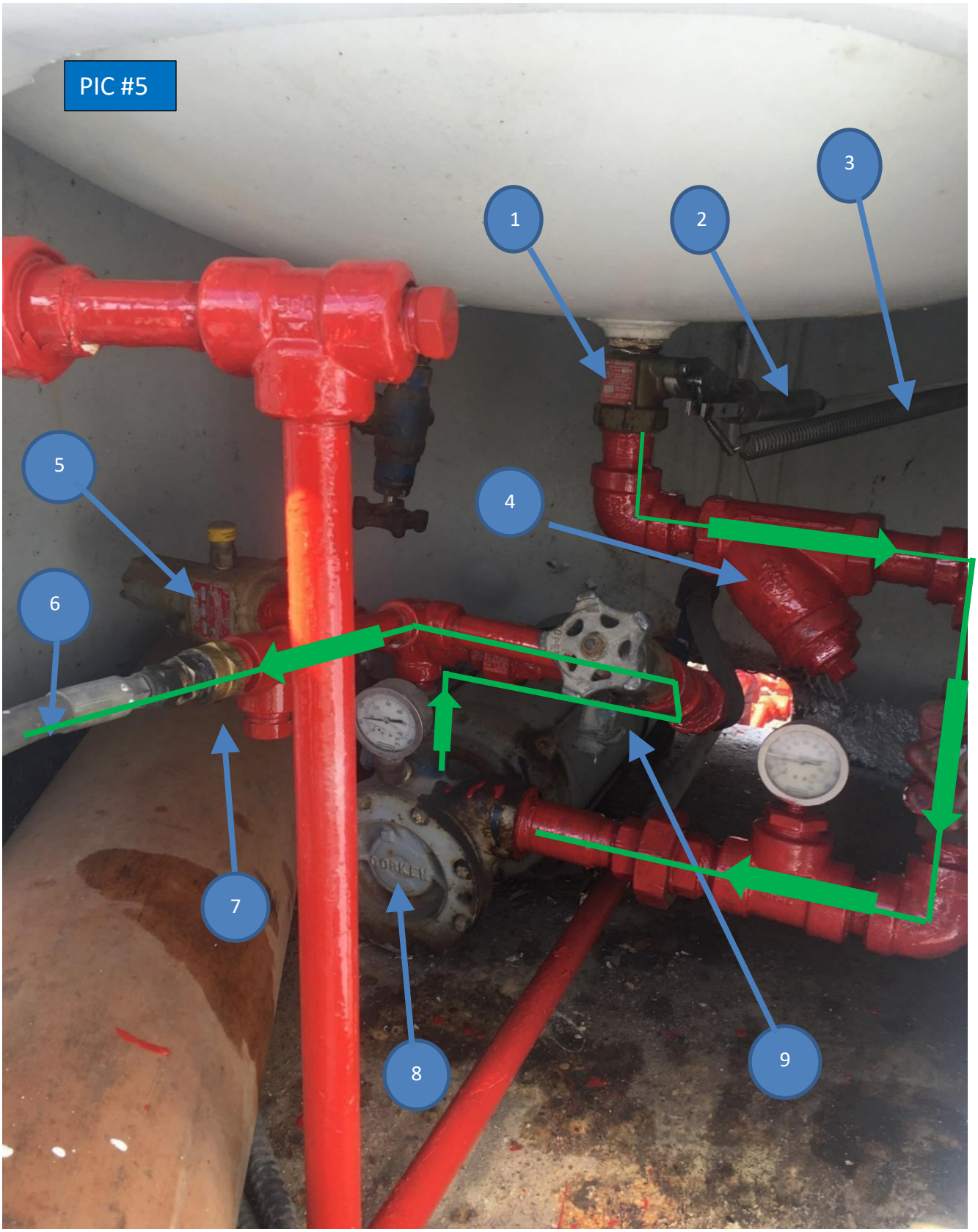
1. Dispenser cabinet housing propane components, pump, cylinder filling hose, fittings and piping and extinguisher
2. Weigh scale used for filling cylinders by weight
3. Vertical propane storage tank
4. Vehicle fuelling dispenser and components.

PIC#3

Propane Cylinder: **Cylinder** — a container designed and manufactured in accordance with a cylinder specification authorized for the containment and transportation of propane under the Transportation of Dangerous Goods (TDG) Regulations of Transport Canada.



Internal Safety Control (ISC) valve


PIC #5
1
2
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PIC #5 (above)

1. Internal Safety Control (ISC)
2. Pneumatic control cylinder
3. Return Spring (replaced after incident)
4. Wye Strainer Fitting
5. Pump bypass valve fitting
6. Approved cylinder filling hose extended to cylinder fill station
7. Excess Flow Valve
8. Pump
9. Manual shut-off with a hydrostatic relief valve

NOTE: green arrows indicate flow of liquid propane from tank outlet through to cylinder fill hose.