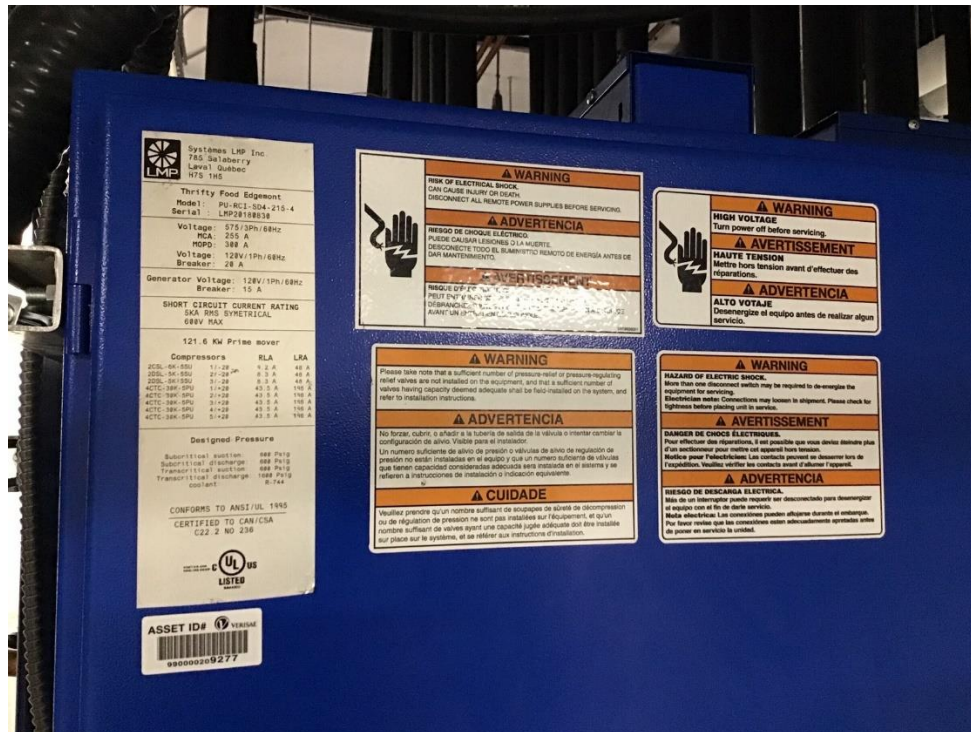
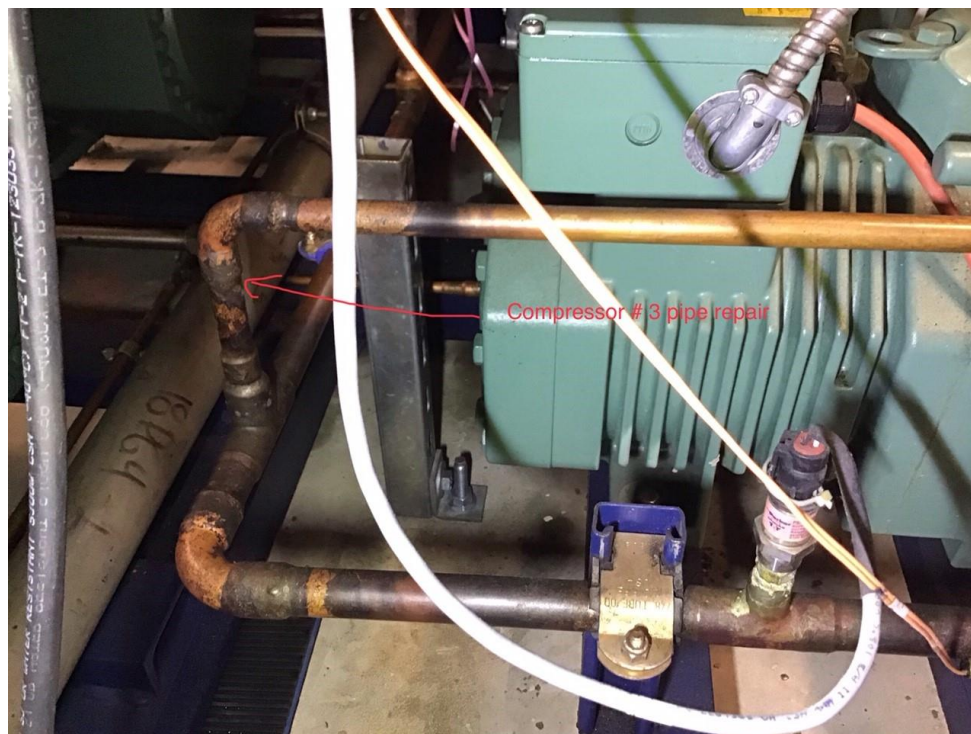


Incident Summary #II-1023571-2020 (#18192) (FINAL)

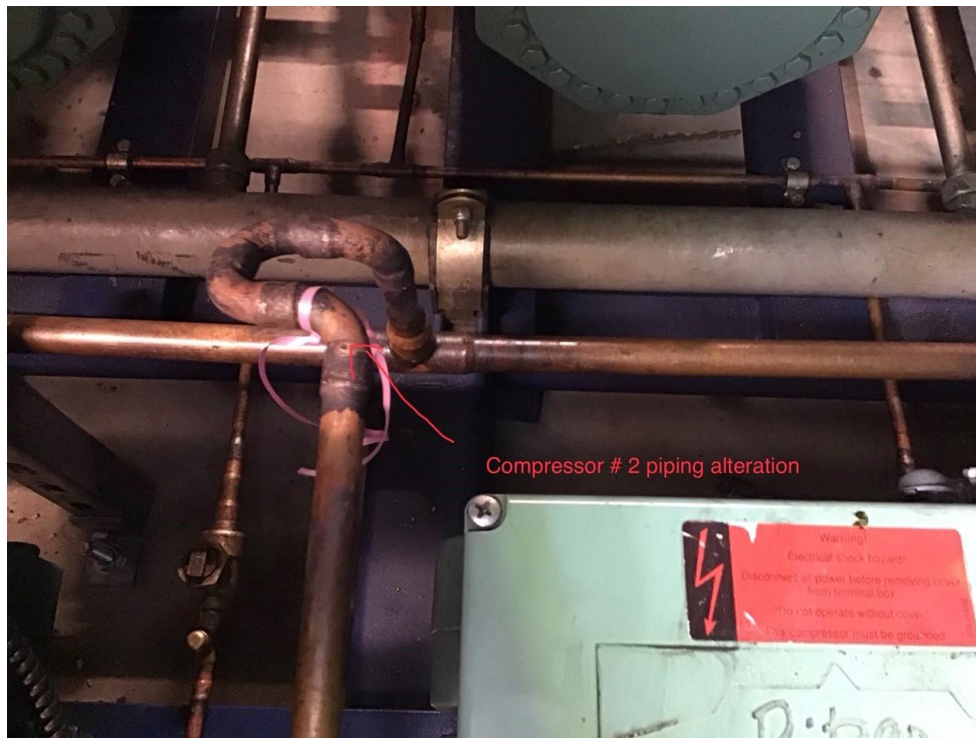
SUPPORTING INFORMATION	Incident Date		June 3, 2020	
	Location		North Vancouver,	
	Regulated industry sector		Boilers, PV & refrigeration - Refrigeration system	
	Impact	Injury	Qty injuries	0
			Injury description	N/A
			Injury rating	None
	Damage	Damage	Damage description	Cracked 90 elbow(5/8”) on the discharge line of Low Temp(subcritical) Compressor # 3
			Damage rating	Moderate
Incident rating		Moderate		
Incident overview		A CO2 refrigeration rack fitting failed and filled the machinery room with 750 lbs of CO2. Fire department evacuated the building.		
INVESTIGATION CONCLUSIONS	Site, system and components		Site: Grocery Store System: CO2 refrigeration direct system for display cases and cold room in the store. Total charge is 2200 lbs CO2. Component: The compressor discharge piping is made out of copper K at 5/8” OD. It sends the refrigerant to the receiver at a pressure of 470 psig.	
	Failure scenario(s)		The compressor rack was installed without vibration pads at the center supports. The compressors VFD(variable frequency drives) were not calibrated properly and produced very high vibration on certain ranges of frequency. The 90 degrees elbow(5/8”) on the discharge line of Low Temp(subcritical) Compressor # 3 cracked and realised 750 lbs of CO2 into the machinery room. Exhaust fan was designed to meet code, but it was inefficient when a large quantify of CO2 was suddenly released at a pressure of 470 psig.	
	Facts and evidence		- General Store Manager Statement: On June 3, 2020 at around 10:30 pm the fire department came to the store due to a fire alarm. The GM noticed that the back of the store had a cloud of CO2 and the CO2 alarm was active. - Interview with the foreman and service reports form the contractor: The refrigeration contractor attended the site and isolated the # 3 compressor after the fire department allowed them in the machinery room. The mechanic repaired(brazed) the cracked fitting. - On June 7, 2020 another CO2 release happened due to a cracked elbow in the # 2 low temp compressor. This time the refrigeration mechanic replaced the piping section. - Very high vibration was observed during the June 9, 2002 investigation. The refrigeration mechanic, also, filmed the leak and the vibration was noticed during the video. After the event, on June 9, 2020 a manufacturers rep performed a vibration analysis and on the highest vibration found was 26 mm/s and 36 G. After modifications the vibration was reduced to 10 mm/s and 8 G. Other contributing factors were the lack of piping braces and CO2 rack vibration pads as per the manufacturer instructions.	
	Causes and contributing factors		Very likely due to high vibration of the CO2 rack.	



CO2 refrigerant rack decal



Compressor #3 fitting repair



Compressor # 2 piping alteration



Copper fitting and section of pipe Compressor # 2