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## Relief Valve (PRD) Diagnosis

### Purpose

The purpose of this document is to outline standard requirements for relief valves used on Chart LNG vehicle tanks, to include inspection, operation, and troubleshooting steps.

### Help

If questions arise while reviewing this document or performing any of the steps or inspections, please call Chart LNG at 800-838-0856.

### Overview

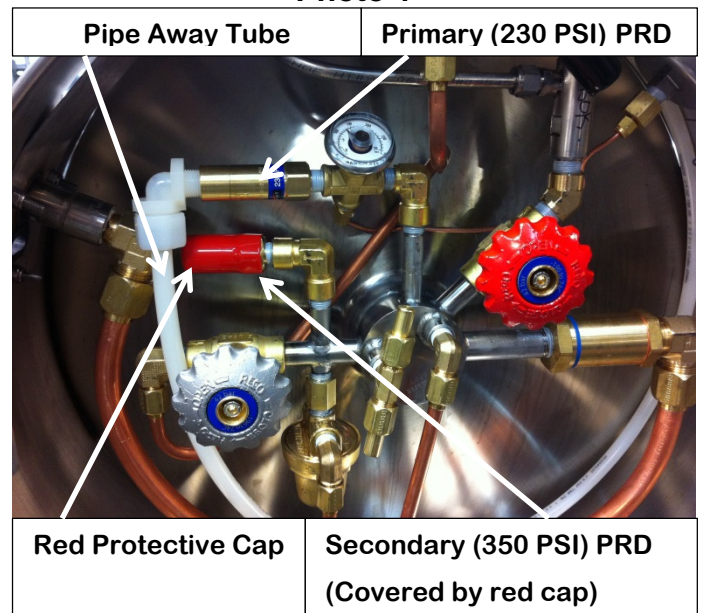
Pressure Relief Devices (PRD's) are a critical part of the many safety features incorporated into the Chart LNG vehicle tank. The Chart LNG vehicle tank uses two PRD's, they are a primary relief valve and a secondary relief valve. The primary PRD is set to operate (open) at ~230 psi or higher, the secondary is set to operate (open) at ~350 psi or higher. The primary PRD should always be piped away to a vent stack per regulations. The primary PRD vent tubing inside the shroud is designed to prevent moisture from entering the primary PRD. The tubing has a small hole at the lowermost portion of the tubing inside the shroud to allow any moisture or debris to drain, and not accumulate in the tube. If properly designed and installed, the vent tubing and stack will pipe away any vented methane to a safe location above the vehicle and operator. The secondary PRD is not piped away and must always have a red protective cap covering it (see photo 1). The purpose of the red cap is to keep moisture and contaminants out of the secondary PRD. The red cap on the secondary PRD also gives an indication as to whether or not the secondary PRD has opened. If the secondary PRD has

opened (red cap missing) it would indicate the primary did not open when it was supposed to, and the pressure in the tank has subsequently risen high enough to open the secondary PRD and blow off the red cap.

**IF THE RED CAP IS EVER FOUND TO BE MISSING FROM THE 350 PSI RELIEF VALVE, THE VEHICLE MUST BE IMMEDIATELY PLACED OUT OF SERVICE AND A FOLLOW UP INVESTIGATION PERFORMED TO DETERMINE A ROOT CAUSE FOR THE MISSING RED CAP.**

**FAILURE TO REMOVE THE VEHICLE FROM SERVICE AND MONITOR THE TANK PRESSURE CAN RESULT IN TANK OVER PRESSURIZATION AND/OR RUPTURE.**

Photo 1



**This procedure is intended for use by trained technicians with experience on systems using LNG. Review all applicable safety documents before beginning this procedure.**



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### Inspection

Chart requires the vehicle operator to perform a visual inspection of the relief valve system while doing their daily pre-trip inspection. The inspection is also to be included as part of any preventive maintenance inspection performed on the LNG system.

The red cap must be installed completely onto the secondary PRD and not show any signs of damage or cracking. The pipe away tube must be present and not visually kinked or damaged. (See photo 1)

**IF THE RED CAP IS EVER FOUND TO BE MISSING FROM THE 350 PSI RELIEF VALVE, THE VEHICLE MUST BE IMMEDIATELY PLACED OUT OF SERVICE AND A FOLLOW UP INVESTIGATION PERFORMED TO DETERMINE A ROOT CAUSE FOR THE MISSING RED CAP.**

If a tank is identified as having a missing red cap, the vehicle must be placed out of service until a follow up inspection can be performed. The follow up inspector must identify the reason for the red cap being discharged. When placing the vehicle out of service a tank pressure inspection must be performed to ensure the tank pressure is not in an over pressurized condition. If the tank is above 200 PSI it must be vented down to 150 PSI and monitored/vented daily until the inspection/repairs can be completed.

**FAILURE TO REMOVE THE VEHICLE FROM SERVICE AND MONITOR THE TANK PRESSURE CAN RESULT IN TANK OVER PRESSURIZATION AND/OR RUPTURE.**

The entire system should be inspected by a qualified technician.

**Note: Always wear required safety gear and eye protection when working around LNG Tanks or using compressed air.**

The technician should inspect the following: (refer to photo 1 as needed)

1. Remove primary PRD nylon pipe away tube and elbow to inspect for signs of dirt or debris inside the barrel of the PRD. Use a flashlight to inspect for moisture, water or ice inside the PRD. Use shop air to lightly blow into the barrel of the PRD and determine if any moisture is present.
2. Inspect the secondary PRD for signs of dirt or debris inside the barrel of the PRD. Use a flashlight to inspect for moisture, water or ice inside the PRD. Use shop air to lightly blow into the barrel of the PRD and determine if any moisture is present.
3. Inspect the entire length of pipe away tubing from the primary PRD elbow to the outlet at the top of the vehicle. Look for any areas or signs of pinched or kinked tubing.

### Primary Relief Valve Vent Stack

The *Primary Relief Valve* should be piped to a safe point on the vehicle. Since methane gas rises it is typically piped to a vent stack that exhausts at the top of the vehicle with flow directed upwards. Since there is a possibility of

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relieving liquid through this line its discharge path should be away from persons, ignition sources or materials that could be damaged by exposure to cryogenic temperatures. To prevent the possibility of water accumulating and freezing in the relief valve line the vent stack should include provisions for excluding rain and wash water from the line and incorporate a low point water drain. The minimum recommended size for vent stack is 1/2" tubing.

The tubing connecting the *Primary Relief Valve* pipe away to the vent stack can be either metallic or non-metallic tubing suitable for low temperature methane service. The minimum tubing size is 1/2".

4. Use a blow gun to blow through the entire length of primary PRD tubing from the nylon elbow to the outlet on top of the vehicle. Ensure no restrictions are apparent. It is normal for a small hole to be present at the lower most portion of the nylon tubing inside the shroud, the hole acts as water/moisture drain.
5. Reinstall the elbow and tighten it hand tight into the primary PRD, then install the nylon tubing into the elbow and tighten its securing nut by hand.
6. The tanks vacuum system must be checked for excessive pressure rise. Refer to Chart LNG service bulletin VT-0019 for proper pressure rise testing procedures.

### Corrective Actions

1. If the tubing is damaged or kinked make the necessary repairs. Do not attempt to reuse any kinked or crushed tubing; rather replace the crushed or kinked tubing. If no moisture, ice or dirt were present in either of the PRD's during inspection steps 1 and 2 above proceed as follows. Lightly blow out both primary and secondary PRD's using shop air and a blow gun; install a new red cap on the secondary PRD.
2. If moisture or dirt/debris is apparent inside either of the PRD's defuel the tank and replace both PRD's (primary and secondary) as a set and install a new red cap on the secondary PRD.
3. If no problems are apparent with the pipe away or tubing de-fuel the tank and replace both PRD's as a set. Then install a new red cap on secondary PRD.

**Note: Always replace both PRD's as a set at the same time.**

4. Ensure the nylon pipe away elbow and tubing has been reinstalled correctly onto the primary PRD, and all connections are hand tight. Do not use a wrench to tighten the elbow or tubing nut as doing so could crack or damage the threads.

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