

University of Virginia - Chemical Engineering
Liquid Nitrogen Training Notes (Praxair Training Session May 25, 2021)

- 1. Can I use a dented liquid nitrogen tank?** Yes --- there is an outer tank that encloses coils to help convert liquid nitrogen to gas by passing it through the warmer exterior of the tank. The interior capsule is where liquid nitrogen is held. The tanks are inspected when they are taken off the truck as well as every 10 years for integrity, etc.
- 2. What can I do if the tank seems to vent excessively?** The 240 L 22 psi tanks can vent as often as 15 minutes, which is no cause for concern. If this occurs more frequently, check 2 things (listed below), and if neither of these fix the problem, return the tank to the loading dock and call Praxair. Leave a note on the tank to let the technician know what you observed.
 - Is there ice built up on the relief valve? Especially on hot days, when the nitrogen tank vents cold gas, ice can form in the valve and hold/jam the valve open. You can pour warm water over the valve to melt the ice. Praxair says you can also use a hammer or wrench to gently tap on the vent valve to knock the ice out of place. Warm water method is preferred.
 - Most tanks contain a **pressure builder**, and if it is open, it will continue to raise the pressure up to the threshold at which the tank is designed to vent, thus causing the tank to vent often. Check that it is closed or partially close the pressure builder valve.
- 3. What is a pressure builder and how does it work?** There is a valve assembly surrounded by tubing on the top of many tanks (**see picture below**). When the valve is open, liquid nitrogen is sent through the coils that run through the warmer external portion of the tank to vaporize the liquid. The vapor is sent back into the top portion of the tank to build pressure (i.e., by producing more vapor). If you need to increase the pressure for a certain application or just because it's low, open the pressure builder valve. If pressure builds too quickly, the tank will just vent. You will likely observe ice build-up at the bottom of the tank (due to removal of heat from the exterior of the tank as the liquid nitrogen vaporizes). Note: when altering the pressure builder valve, it takes time to build the desired pressure; simply open or close the valve slightly as needed and wait (~30 minutes or so) before checking the pressure gauge again to read the new pressure.
- 4. What if there is ice build-up on the top/center of the tank?** Ice build-up can occur due to venting, active use of the nitrogen tank (such as for purging a glovebox), or an open/leaky valve. When the weather is hot and humid, you will see this more often. If ice build-up is so extensive that it results in a block of ice on the nitrogen level gauge while not actively using the tank, move the tank to the loading dock and call Praxair. However, if there is a small amount of ice and you can access the gas or liquid dispensing valves that may be open, you can close them. Or perhaps the vent valve is open accidentally? Close it. (**note this is the valve you can turn – not the pressure relief valve that you should not touch**).

5. **Should I touch the vent valve?** Praxair recommends against adjusting or touching the vent valve. If the tank over pressurizes, it will vent on its own. There is also a failsafe – the burst disk on the side of the tank, which will pop out if pressure builds that cannot be released through the relief valves (**which look like open metal tubes, see picture below**).
6. **What if a tank falls over?** Let it fall. Unlike gas cylinders, nitrogen tanks do not run the risk of explosion or high energy/velocity propulsion if knocked over. Full tanks are 700 pounds, and the risk of injury is high should you try to catch it. Moving the tank is one of the biggest risks in handling liquid nitrogen, since there are many fail safes to prevent explosion of the tank. Pull the tank rather than pushing it and hold it with two hands – using the handle on the side as well as on the top. When navigating over elevator thresholds or other challenging terrain, recruit two people.
7. **What should I consider when moving a tank?** Moving the tank one of the biggest risks in handling liquid nitrogen, since there are many fail safes to prevent explosion of the tank. Pull the tank slowly rather than pushing it and hold it with two hands – using the handle on the side as well as on the top. When navigating over elevator thresholds or other challenging terrain, recruit two people. Be sure everyone knows that it is possible that the tank will vent unexpectedly so that they are not startled. It would be dangerous to have someone be startled and have the tank fall on them. As noted above, the vent valve should not be touched, and the nitrogen tank should never be moved with the vent valve open.
8. **What if a tank has 2 relief valves?** One activates at 22 psi and the other at 230 psi. This means that this tank is designed to hold either pressure setting. There is a valve that allows you to go back and forth between the two, and this should not be touched. The tank is set at the pressure that is selected upon ordering. If someone does manipulate the valve, just call Praxair, and return the tank so they can reconfigure it correctly or bring you a new tank.
9. **What if I order a high-pressure tank by mistake?** Return it to the loading dock and call Praxair. Dispensing liquid would be extremely dangerous, and dispensing gas will be extremely loud. The venting in a high-pressure tank is so loud that you will likely require ear plugs to move it.
10. **What are the numbers on the sides of the gas valves?** All gas valves on nitrogen tanks are numbered '580', and liquid nitrogen dispensing valves are numbered '395'. This numbering convention is to prevent unwanted mixing of different gases.

