



# UNIVERSITY of LOUISVILLE

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## LIQUID NITROGEN DEWAR FILLING SOP Feb, 04, 2010 / By Chris Burns

Purpose – This SOP describes filling the Burns group liquid nitrogen dewars from the 24,000L liquid nitrogen reservoir at the back of Shumaker Research Building, UofL.

- Prior training is required. This is a **hazardous** procedure !!!
- Load the empty liquid nitrogen cylinder on the green cart and get the liquid N<sub>2</sub> tool bag from Dr. Burns. Make sure you have leather gloves, ear protection and safety glasses with you. Two pairs of gloves and labeled individual ear plugs should be stored in the tool bag.



- Push the cart and dewar over to the 24,000L liquid nitrogen reservoir at the back of Shumaker Research Building and remove it from the cart. You should point the vent in the direction of the wall and away from you.
- There must be two persons present (buddy system).



- Heavy, non-porous (e.g. leather) gloves, safety glasses, and hearing protection are required.



- The dewar must be vented and open to the atmosphere before filling can begin.
- Do not fill during inclement weather (e.g. raining, very windy, icy/snowbound filling area)
- When instructed to do so, all valves and fittings should be closed snug. DO NOT OVERTIGHTEN!!!
- The procedure below is for a cold tank (there is 10% left when dewar stops delivering liquid).

**PROCEDURE** – every single step is important! Skipping or mis-understanding a step can cause serious injury and/or damage to equipment. Read thoroughly!

**Prepare the filling station and dewar**

- 1) Open each of the gray vent and blue liquid valves on the dewar, to clear out any debris & moisture and release pressure built up in the cylinder.



1) Empty Cylinder,



2) But still pressurized...



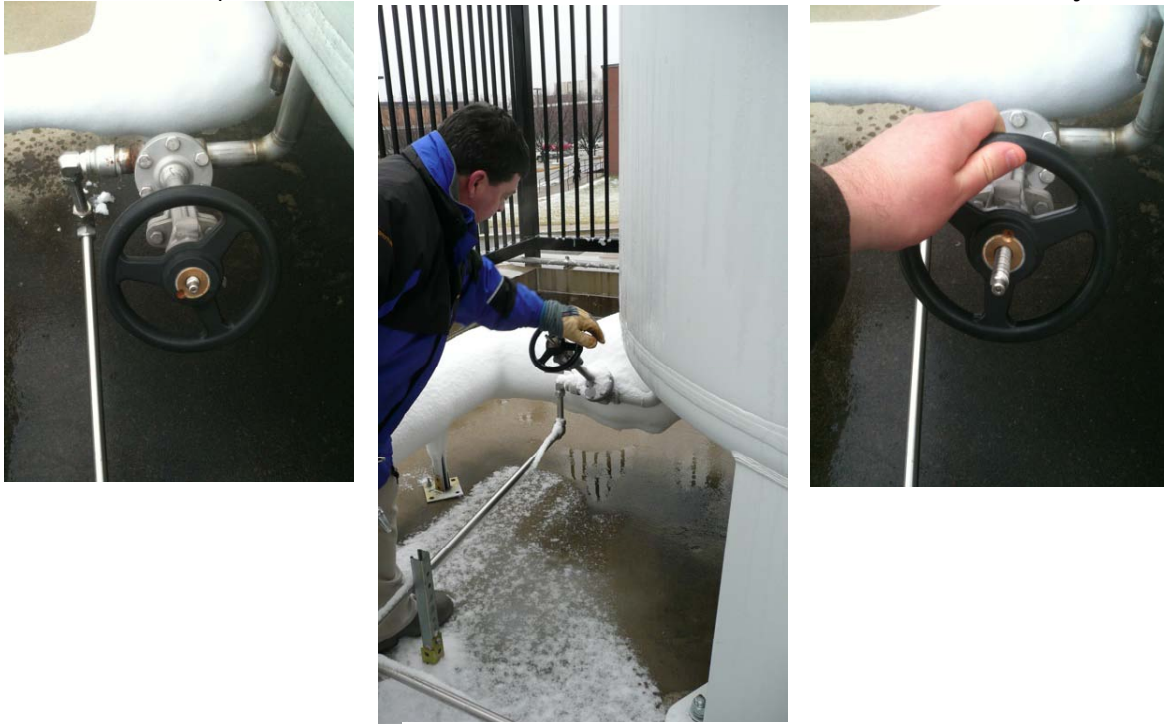
Open the Gray vent valve to release the pressure...





Open the blue liquid vent valve and make sure to not get sprayed by liquid Nitrogen...

- 2) In the meantime, open the black-wheeled valve behind (streetside of) the reservoir all the way.



Opening the Reservoir main valve

- 3) Remove the dust guard from the fill hose and firmly hold the fill pipe, and point it away from any hardware and personnel (e.g. towards vapor tower).



Dust Guard



Dust Guard Removed



Point Away!!!!

- 4) Open the gray fill station valve to purge fill hose, and to clean out any dust, condensation, etc. You should use a fairly violent blasting. Continue purging until you see white vapor for several seconds coming out of the fill hose.



Grey fill station valve



Open 1 turn of valve...



Point Away!!!!



Line freezes as liq. N<sub>2</sub> flows



Purging the fill hose

Vapor tower

- 5) Close the gray fill station valve and connect the fill hose to the blue liquid valve on the dewar. Do not overtighten or damage will occur (steel nut on brass threads).



Attach fill hose to the blue liquid valve of dewar. Make sure not to overtighten the connections!!!

- 6) Make sure the dewar gas vent is oriented towards the vapor tower.

### Fill the dewar

- 7) Make sure your hearing and eye protection is in place.
- 8) Make sure the grey dewar gas vent is open all of the way, then  $\frac{1}{2}$  turn back to prevent freezing in this position.
- 9) Make sure the blue dewar liquid valve is open all the way, then  $\frac{1}{2}$  turn back to prevent freezing in this position.
- 10) Open the gray fill station valve to start filling the dewar, opening it most of the way. Extremely loud gas will be shooting out the dewar's gas vent.



- 11) The dewar pressure should settle down to approx. 20-40 psi during the fill. Frequently rotate all three valves (fill station, liquid, and gas) to ensure that they won't freeze into position.



- 12) Monitor the level gauge on the dewar for fill progress, should be about 10min to fill up. When white jet starts to emerge from the gas vent and the pitch of the escaping gas lowers/changes, the dewar is full.



- 13) Shut off the gray fill station valve.
- 14) Close the blue liquid valve on the dewar almost all the way. Gas will continue to vent from the gas vent.
- 15) ***IMMEDIATELY***, but carefully while wearing the leather gloves, loosen the fill hose a little and allow any pressure/liquid to escape. *Make sure to stay out of the way of any liquid N<sub>2</sub> that is released. Some residual liquid N<sub>2</sub> will be released that is present in the hose during the hose disconnection process.* Once you have vented the hose completely close the blue liquid valve on the dewar and then disconnect the fill hose from the dewar. You need to depressurize this hose right after step #15, or else the hose will explode violently! Reattach the dust guard to the end of the fill hose and store the fill hose in the PVC pipe.
- 16) The dewar will still be venting gas. Close the grey dewar gas vent valve.

### ***Finish the job***

- 17) Close the black-wheeled main reservoir valve at the back of the reservoir.
- 18) Holding onto the fill hose, open the gray fill station valve to depressurize the pipe. Make sure to totally depressurize the pipe so that no more gas/liquid is being delivered. Then close it.
- 19) Place the full liquid nitrogen tank back on the cart and bring it back to the lab. Make sure to collect all the tools, gloves, and ear protection and place them in the liquid nitrogen tool bag and bring that back to the lab.

