國家同步輻射研究中心
National Synchrotron Radiation Research Center

Operation procedures for liquid nitrogen refilling system at gas cylinder storage area

Drafted by Radiation and Operation Safety Division, approved by 66th safety committee, Jun. 2 2004

1. To be qualified to operate liquid nitrogen refilling system, users must fulfill the followings. Fill out the application permission form (as attached) and submit to Cryogenics Group. Learn the operation procedures and safety notes. Receive hand-on safety training and obtain qualification to be authorized to access the refilling system.
2. It requires a team of at least two qualified persons to refill liquid nitrogen, and you must not involve in refilling process when in fatigue.
3. You must be aware of the operation procedures and safety notes before operating refilling system. Follow the standard operation procedures faithfully without changing any defined condition.
4. Use appropriate protection equipment during refilling, such as glove, goggle, face-shield and ear-muffs to prevent cold contact burns if spills.
5. Prepare connector before refilling. Don't contact the valve and the surface of container and don't stand at the direction of venting during refilling. You must watch the whole refilling process and must not leave. Stop the refilling immediately if any abnormal situation occurs and report to Cryogenics Group.
6. If pressure reduction is necessary during the refilling of liquid nitrogen or compressed gas, you must adjust the regulator. Close the regulator first and open the source of compressed gas secondly, re-open regulator and adjust flow rate to accommodate desired pressure. It is not allowed to open compressed gas source while the regulator is left open simultaneously. Depressurization is required after the use of high pressure device.
7. Interior of pipe line, valve, gauge, regulator and gas transport line should be kept clean without contamination of oil or impurities.
8. High pressure vessel must not be connected to liquid nitrogen refilling system. The liquid nitrogen container must have relief valve with pressure setting less than $2kg/cm^2$.
9. The residual pressure of liquid nitrogen container must be less than 0.5 bar before safe refilling initiates.

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Application permission form for liquid nitrogen refilling system at gas cylinder storage area

I have read the "Operation procedures for liquid nitrogen refilling system at gas cylinder storage area". I also understand the worst probable hazards associated with this refilling are the cold contact burns to the skin and respiratory system, and those consequences originating from spills. I have received the hand-on safety training and I will comply with the requirements indicated above and other NSRRC regulations.

Applicant: _____ Affiliation (group): _____

Telephone: _____ Date of application: (yyyy.mm.dd) _____

NSRRC contact person (for outside user only) _____ Telephone of contact person: _____

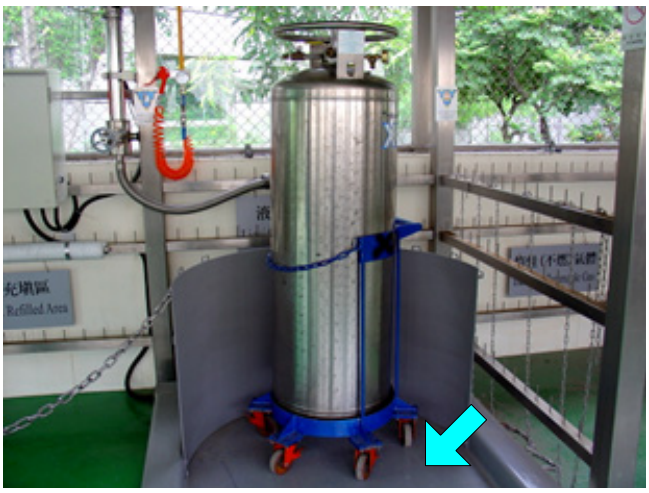
(Applicant must leave blank)

Hand-on safety training: _____

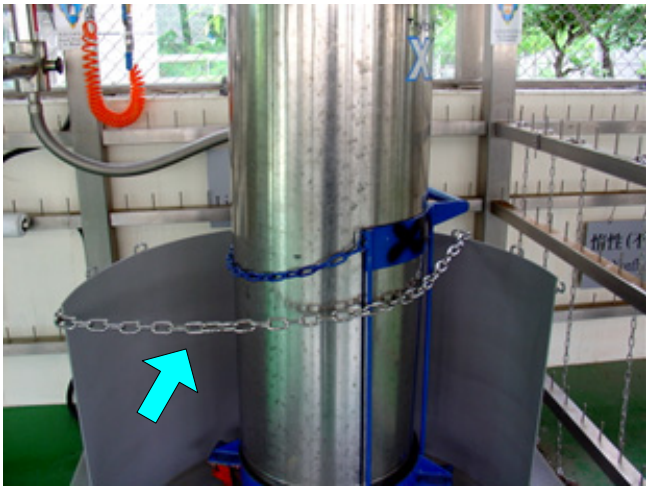
ID number: _____

Note: When you complete this form, please submit to Cryogenic Group to get access permission, and then forward to Radiation and Operation Safety Division.

Preparation before liquid nitrogen refilling



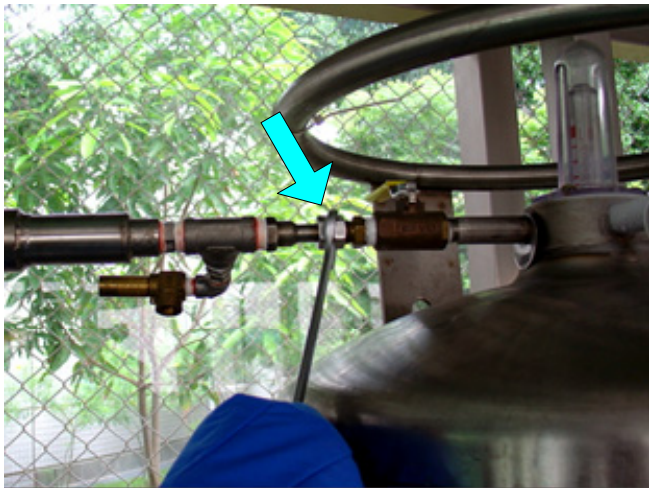
(1) Sit the liquid nitrogen container on the scale.



(2) Secure the container with the chain.

(3) Use protective glove, goggle and ear-muffs.

(4) Open venting valve till the pressure is less than 0.5 bar.



(5) Connect the refilling pipe line.

(6) Make sure the residual pressure is less than 0.5bar, then open the refilling valve.

Refilling procedures

(1) Enter access card and punch *2#

(2) As permission is granted, green indicator will show.

(3) Push “Start Filling” button.

(4) Weight will be shown on the scale during refill.

Watch the reading whether refilling continue.

no

yes

(5) Refill will stop at every 20KG increment. (Refill will stop 10 seconds at every 90 seconds interval)

(6) Push “Stop Filling” button

Wait 2min

yes

If refill continues?

no

Refill completed

After refill is completed

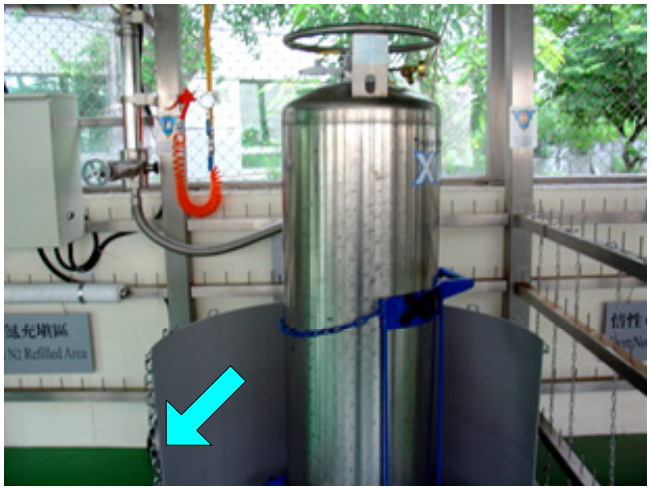
(1) Defrost the frozen connector by using compressed air.

(2) When nitrogen exhaustion diminishes, close the refilling valve.

(3) Remove the refilling pipe line.

(4) Return the refilling pipe line to the right place

(5) Close the venting valve



(6) Release the securing chain.