

**University of Saskatchewan
Department of Mechanical Engineering
Standard Operating Procedure # TE0006**

Procedure Title: Cryogenic Storage Vessel Safe Handling

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1. Version History

Version #: 1.1 Supersedes: n/a

2. Hazards

1. Extreme cold. Unprotected skin can stick to metal surfaces cooled by liquid nitrogen causing skin to tear when pulled away.
2. Since nitrogen gas is invisible, it can cause suffocation without warning. Use in well ventilated areas.

3. PPE Required

1. Face shield
2. Cryogenic gloves
3. Cryogenic apron
4. Handle vials with tongs

4. General Safety Considerations

Only trained and qualified personnel should handle the Cryogenic Storage Vessel and liquid nitrogen. This training includes, but is not limited to, reading and understanding all available and relevant literature (Safety Data Sheets and Liquid Nitrogen Handling Procedures), standard operating procedures and/or protocols and participating in all related site specific training. For the SOP of handling liquid nitrogen, refer to:

https://safetyresources.usask.ca/procedures_forms/documents/Info%20Sheet%20%20-%20Handling%20and%20Transport%20of%20Liquid%20Nitrogen.pdf.

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5. Caution

1. Never overfill the liquid nitrogen vessels.
2. When inserting or removing cans, be careful not to come in contact with the neck tube area of the vessel.
3. Remove or insert cans slowly, in a vertical manner. Scratches on the neck tube area can cause premature vacuum failure.
4. Do not spill liquid nitrogen on the vacuum port - this can cause vacuum failure.
5. Follow all necessary precautions and warnings relevant to applicable hazards such as frostbite, contact burn, asphyxiation, etc. in cryogenic areas.
6. To avoid injury due to frostbite or ruptured vials, use extreme care whenever handling liquid ni-trogen, liquid nitrogen storage or transfer vessels or any objects which have come in contact with liquid nitrogen.
7. Leave no areas of skin exposed.
8. Wear adequate PPE where necessary: face shield, cryogenic gloves, cryogenic apron.
9. Always handle vials with tongs.
10. Do not tightly seal liquid nitrogen containers or prevent nitrogen gas from escaping.
11. Use extreme care to prevent spilling and splashing liquid nitrogen during transfer and removal of storage contents and holders.
12. Immediately remove any clothing or safety attire on which liquid nitrogen has been spilled or splashed.
13. Get immediate medical attention for any frostbite injuries due to liquid nitrogen.
14. Do not tamper with, or remove the vacuum port (covered by a black plastic cap on the side of the vessel); this will void warranty.
15. Always keep liquid nitrogen in an upright position.
16. BioCane cryobiological storage systems are not transportation vessels. Transport carts are designed for mobility within the lab or lab to lab only. Moving full vessels long distances, over cracks in floor, thresholds, on inclined ramps or in elevators can cause premature vacuum failure.
17. The most prevalent cause of failure of liquid nitrogen storage vessels is mechanical. The vessel neck tube supports the full weight of the inner shell and all liquid nitrogen it contains. A side or corner blow to the vessel causes the inner shell to swing in a pendulum motion causing the neck tube to be damaged. Any storage vessel which has been exposed to an accident, has been dropped or lowered to hit on one corner will tend to fail more rapidly than one which has not.

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6. Procedure

1. To avoid damage to the cryogenic storage vessel which may result in premature vacuum loss, it is important to use the following procedure during the addition of liquid nitrogen to a warm vessel:
2. Add only a small amount of liquid nitrogen (2-10 liters) to new or warm vessels.
3. Allow this small amount of liquid nitrogen to sit in the covered vessel for a minimum of 2 hours. This will limit stress caused by the sudden temperature change associated with adding liquid nitrogen to a warm vessel.
4. Add an additional 2-10 liters liquid nitrogen to the vessel.
5. Allow the vessel to sit for 48 hours and monitor liquid nitrogen consumption.
6. Fill the vessel as desired. Remember to allow for the displacement of liquid nitrogen when cannisters and canes are inserted.
7. Insert and remove cannisters slowly. Allow liquid nitrogen to run out of cannisters.
8. Monitor the consumption of liquid nitrogen on a regular basis, i.e. every 1-2 days.
9. Fill the liquid nitrogen vessel on a regular basis, i.e. every 2 weeks, or every time after thawing cells.

7. Measuring Liquid Nitrogen Quantity

1. Use a wooden yardstick to measure the liquid nitrogen level. Never use a hollow tube or plastic dipstick to measure the liquid nitrogen level.
2. The level will be indicated by a frost line which develops when the dipstick is removed and waved in a back and forth motion away from the user.

8. Bibliography

1. BioCane™ Type CK50900, Cryobiological Storage Vessel, Operation Manual and Parts List LT509X17 (7000807) Rev. 9