

Risk Assessment Form

Procedure	Safe Handling, Storage & Transportation of Dry Ice (solid carbon dioxide)
------------------	---

Name(s) of person performing the work	Users (Lab manager & Lab Technician & Tenants & Licensee's)		
Name & position of assessor	Khwaja Islam & Laboratory Manager	Signature	
Date of assessment	06/09/2018	RA Number	BioE 0030

Outline of procedure / activity:

Dry ice is solid carbon dioxide (CO₂). It is made by compressing and cooling CO₂ until it liquefies. Expansion converts the liquid into snow form of the solid state. The snow is then compressed by a hydraulic press into dry ice blocks, slices or pellets.

Properties:

- Solid state.
- It sublimates (turns from a solid) to an asphyxiant gas that is heavier than air without passing through a liquid phase.
- Non-flammable.
- Temperature of dry ice is (-78°C).
- Asphyxiant.
- Colourless gas with a slightly pungent odour which is only detectable in high concentrations.

Used as a cooling / freezing agent in laboratory procedures or for transportation of biological samples (i.e. package items that must remain cold or frozen).

Storage of Dry Ice:

Type 160K cardice storage container is an insulated (polyethylene with polyurethane) container and low temperature seals which will keep perishable products frozen longer for unproblematic transportation. With a rugged construction and closing lid that still allows the substance to sublimate, the build-up of pressure is prevented as the ice eventually returns to the gaseous state. Dry ice containers have handles & castors for easy carrying between laboratories.

Specification of Type 160K cardice storage container:

- Dry ice capacity: 160kg loose pellets, 10 bags or 14 Dry ice blocks
- Single cantilever catch
- Fitted with 4 tubular steel feet (allows fork lift access)
- Set of castors
- Drain plug

- Weight 46kg

Procedure:

Dry ice bags are delivered to the distribution centre by BOC. They then need to be moved to Level 1 of the Innovation Building where they are stored in the freezer room (696.20.23). The procedure for transporting of dry ice as follows:

1. Collect the lift **calling** key from Lab manager's office (level 0) (Ext. 18801) for the goods lift.
2. Dry ice bags will be delivered by the FM support staff to the lab manager or lab technician for storage.
3. Load the bags of dry ice onto the trolley.
4. Using the lift **calling** key to call the lift to ground floor where the lift door will open.
5. Place the trolley with dry ice bags into the goods lift. **Never** travel in the goods lift with the dry ice. Remove the lift **calling** key.
6. Take the passenger lift or stairs to the 1st floor.
7. Using the lift **calling** key to call the lift to level 1 where the lift door will open.
8. Remove the trolley from the goods lift and take it to the freezer room and empty the dry ice bags into the cardice storage container with the appropriate PPE worn (i.e. safety glasses and cryogenic gloves).
9. Return the lift **calling** key to Lab manager's office (level 0) and trolley to ground floor area.
10. Dry ice in packaging can be unloaded into the cardice storage container by cutting the bag open with scissors. Avoid leaning into the container for longer than necessary when emptying the bags into the cardice storage container.

Note: Staff must be trained on handling and transportation of dry ice. Cross reference to COSHH assessment BioE 007 Dry ice.

Safety Precautions:

- Do not handle with bare hands. Use cryogenic gloves (wrist length or mid-arm). Temperature of Dry ice is -78°C and can cause injury similar to a burn.
- Store dry ice in an insulated container in well ventilated area, but not in an airtight container. Airtight containers may explode as dry ice converts to CO_2 gas.
- Use dry ice in a well-ventilated area. When dry ice sublimates, it gives off CO_2 and cause suffocation.
- Dry ice is harmful if eaten or swallowed. Do not ingest.
- Do not store dry ice in a working refrigerator or freezer – it will sublimate at a faster rate than in an insulated storage container and the extremely cold temperature may cause the thermostat to cut out.
- A little bit of dry ice will sublime to a large volume of gas.
- Water on solid dry CO_2 increases sublimation with a corresponding higher risk of asphyxiation.
- Take care when carrying packages of dry ice.

Potential hazards

Substance or item handled	Associated Hazard (s)	Existing Control Measures	Risk (L/M/H)	Further Action required	Risk (L/M/H)
<p>Dry Ice (Refrigerated Solid Carbon Dioxide)</p>	<p>Asphyxiation – in concentrations sublimed vapour may cause asphyxiation. (10kg of dry ice sublimates into about 5.4 m³ of CO₂ gas).</p> <p>Extreme cold (-78°C) – contact with dry ice may cause cold burns or frost bite.</p> <p>Explosion due to pressure build up if kept in gas tight containers.</p> <p>Sublimes (changes state from solid to gas – the product will not melt to a liquid).</p>	<p>Wear appropriate PPE.</p> <p>Safety glasses are worn when handling dry ice.</p> <p>Cryogenic gloves are worn when handling dry ice.</p> <p>Laboratory coat (fastened) is worn when handling dry ice.</p> <p>Manual handling and cryogenic safety training attended by personnel and only trained personnel are allowed to handle dry ice.</p> <p>Four wheeler trolley is available for transportation of dry ice. Trolley inspected to ensure good condition.</p> <p>Dry ice stored in an insulated container specifically designed for storing dry ice.</p>	<p>M</p>	<p>No further action required if the existing control measures are adhered to.</p>	<p>M</p>



		Low level extraction in the room (30 air change per hour).			
--	--	--	--	--	--

Persons potentially at risk:

Lab manager & Lab Technician & Tenants & Licensee's

Action in event of an accident or emergency:

1. **Emergency spillage procedure:** Evacuate area, Deploy warning signs if necessary. Wear PPE. Ventilate the area, open doors or windows if applicable or activate force ventilation to allow gas to disperse. Do not re-enter area without self-contained breathing apparatus unless it is provided safe to do so. Breathing apparatus should be only be used by trained personnel.
2. **Dispose of unwanted dry ice** by allowing to evaporate in a well-ventilated area – it will sublime leaving no residue.
3. **First Aid Measure:**
 - Inhalation** – Remove victim to uncontaminated area wearing self-contained breathing apparatus. Keep victim warm and rested. Obtain medical attention. Apply artificial respiration if breathing stopped.
 - Eye contact** – In case of frost bite spray with water for at least 15 minutes. Apply sterile dressing. Obtain medical attention immediately.
 - Skin contact** – In case of frost bite spray with water for at least 15 minutes. Apply sterile dressing. Obtain medical attention immediately.
 - Ingestion** - Obtain medical attention. Swallowing must be absolutely avoided, since coldness and developing pressure could be dangerous.

Arrangements for monitoring effectiveness of control:

Weekly inspection of dry ice insulated container to check that:

- a) The container looks to be in good order, is being used correctly.
- b) It is fit for the purpose.



Review of the Risk Assessment:

Date of review		Name of reviewer	
Date of next review		Signature	

Have the control measures been effective in controlling the risk?

Yes	No
-----	----

Have there been any changes in the procedure or in the information available which affect the estimated level of risk from the listed substances

Yes	No
-----	----

What changes to the control measures are required?

--



Declaration by Tenants/Licensees/Technicians:

I confirm that I have read this Risk Assessment and that I understand the hazards and risks involved and will follow all of the safety procedures stated. Where PPE has been identified as a control measure, I will ensure that it is worn.

Declaration by Laboratory Manager (LM):

I confirm that the tenant/licensee/technician who has signed below is competent to undertake the work. My counter-signature indicates that I am happy for the work to proceed.

Name (Please print)	Signature	LM Countersignature	Date



Name (Please print)	Signature	LM Countersignature	Date