

## Guidelines for Safe Storage, Use and Handling of Dry Ice

### FACTS ABOUT DRY ICE

Dry ice is the frozen form of carbon dioxide. Most frozen solids return to a liquid form when they are heated. Frozen carbon dioxide does not become a liquid. It transforms into a gas. This transformation process is referred to as sublimation. Dry ice sits at a temperature level of minus 109 degrees Fahrenheit.





This material melts into a gas quickly so it should be purchased as close to the usage time as possible. Dry ice will keep things refrigerated and frozen when the power goes out.

The main hazards of dry ice include burns and asphyxiation. Insulated gloves must be worn when handling dry ice. Use of dry ice in poorly ventilated areas can result in depletion of the oxygen level resulting in asphyxiation.

Dry ice (Carbon Dioxide – Solid) is classified by both the Transportation of Dangerous Goods (TDG) and the International Air Transport Association (IATA) as a dangerous good Class 9, Packaging Group III.



### GENERAL SAFETY “CAUTION” GUIDES FOR DRY ICE

	<b>DO NOT TOUCH</b> Use insulated gloves, towels or pot holders to move dry ice. Use in a ventilated location.
	<b>DO NOT EAT</b> Dry ice is harmful if eaten or swallowed. If ingested, seek medical help immediately.
	<b>COULD CAUSE SUFFOCATION</b> Dry ice changes to CO <sub>2</sub> gas as it sublimates, causing a lack of oxygen. Only use dry ice in open or well-ventilated areas. Do not store in confined spaces and never store near a sleeping area.
	<b>DO NOT PLACE IN AIRTIGHT CONTAINERS</b> Airtight containers may explode as dry ice converts to CO <sub>2</sub> gas.

### GUIDELINES FOR SAFE STORAGE, USE AND HANDLING OF DRY ICE

#### ACQUISITION AND PICK-UP TIME

University researchers should purchase dry ice via PO and have it delivered to the University. However, small quantities (25 pounds or less in total) can be purchased via PO or P-card in alignment with purchasing rules and transported by University personnel as long as the transportation and labeling requirements below are adhered to in accordance with

49 CFR 171.8. Users should plan to pick up the dry ice as close to the time it is needed as possible. It sublimates at 10%, or 5 to 10 pounds every 24 hours, whichever is greater.

## TRANSPORTING

Per the Code of Federal Regulations (49 CFR 171.8), a Material of Trade (MOT) exemption allows the University to transport permissible amounts of dry ice by a private motor carrier as long as it is in direct support of a principal business (i.e.: University research) and meets the regulatory requirements below.

### Material of trade (MOT) exemption requirements:

The <b>MOT</b> exemption <b>does not</b> require the transporter/University:	The <b>MOT</b> exemption <b>does</b> require the transporter/University to know:
<ul style="list-style-type: none"> <li>• Shipping papers (shipper’s declaration),</li> <li>• Emergency response information,</li> <li>• Placarding, UN numbering,</li> <li>• Formal training and maintain record retention.</li> </ul>	<ul style="list-style-type: none"> <li>• General knowledge of MOT regulations (provided in this memo),</li> <li>• Quantity limitations,</li> <li>• Packaging requirements,</li> <li>• Marking and labeling requirements.</li> </ul>

**IMPORTANT!!** For safety protection, the maximum permissible quantity for individual purchase and transport established by FIU is **25 pounds of dry ice**. *\*Employees using his or her personal vehicle for transport are strongly encouraged to discuss coverage with their insurance carriers.*

The dry ice should not be removed from the manufacturer plastic bags and should be placed as is in thermally insulated containers for transport, and kept at the lowest possible temperature to maintain the solid and avoid generation of Carbon Dioxide gas. The packaging must be marked with a common name or proper shipping name to identify the material it contains.

If dry ice is transported inside a car or van for more than 15 minutes, make sure there is fresh air. After 15 minutes with dry ice only in a plastic bag in the passenger seat and without circulating fresh air, users may start to feel symptoms such as increased respiration and headaches. **Always allow adequate ventilation of fresh outside air.**

## STORAGE AND HANDLING

- Do not handle solid Carbon Dioxide with bare hands
- Use heavy cryogenic gloves or dry ice tongs and handle carefully to prevent dropping
- Do not store dry ice in a standard refrigerator, cooler, or freezer designed for food storage
- Containers should be stored upright and be firmly secured to prevent against physical damage
- Isolate from other non-compatible chemicals
- Containers should be vented, to prevent the build-up of Carbon Dioxide gas
- Containers should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight, away from heavily trafficked areas and emergency exits, elevators, building and room exits or main aisles leading to exits
- All spills need to be reported to EH&S
- If stored in closed areas, engineering controls in order to maintain concentration of Carbon Dioxide below the TLV of 5000 ppm in the event of a release is required

## VENTILATION

Normal air is 78% Nitrogen, 21% Oxygen and only 0.035% Carbon Dioxide. Dry ice gives off CO<sub>2</sub> which may cause difficulty breathing or suffocation. If the concentration of carbon dioxide in the air rises above 0.5%, carbon dioxide can become dangerous. If dry ice has been in a closed area or walk-in for more than 10 minutes, open doors and allow adequate ventilation before entering. Leave area containing dry ice if you start to pant and breath quickly, develop a headache, or your fingernails or lips start to turn blue. This is the sign that you have breathed in too much CO<sub>2</sub> and not enough oxygen. Dry ice CO<sub>2</sub> is heavier than air and will accumulate in low spaces. Do not enter closed storage areas that have or have had stored dry ice before airing out completely.

## BURN TREATMENT

Treat dry ice burns the same as a regular heat burns. See a doctor if the skin blisters or comes off. Otherwise if only red it will heal in time as any other burn. Apply antibiotic ointment to prevent infection and bandage only if the burned skin area needs to be protected.

## COUNTERTOPS

Do not leave dry ice on a tiled or solid surface countertop as the extreme cold could crack it. Do not leave it unattended.

## POWER OUTAGE

If the electricity is out for a brief period of time, keep the refrigerator and freezer closed. The time everything will stay frozen or cool will depend on the type of freezer or refrigerator, the thermostat setting, and the temperature surrounding the appliance. On hot summer days after the first hour, for every hour off, an equivalent day of storage will be lost for refrigerated items. Three to six hours could represent two to five days of storage. For the freezer, depending on how full it is, (the fuller, the better) things will stay frozen from three to six hours in a refrigerator freezer and up to twelve hours for a chest freezer.

## FREEZER NOT WORKING

Do not touch dry ice directly. Use insulated gloves, potholder, towel, etc. Use the following guidelines for each type of freezer. For each 24-hour period:

- (1) Freezer on bottom: use 15 to 25 pounds.
- (2) Freezer on top: use 20 to 30 pounds.
- (3) Side by side freezer: use 30 to 40 pounds. Place each slab, starting with the top shelf, on top of the food to be kept frozen. Bottom shelves will be kept frozen by the dry ice above it.
- (4) Chest freezer: use 40 to 50 pounds. When taking out the frozen food, carefully lift the dry ice slab up with gloves, potholder, towel, etc., without touching the dry ice directly.

## REFRIGERATOR NOT WORKING

For each 12 to 24 hour period, place a ten pound slab of dry ice on bottom shelf of the refrigerator to cool. Do not touch dry ice with bare hands. Do not place it directly on the glass shelf, but use newspaper or other insulated protection such as a hot pad between the dry ice and the shelf. When the dry ice is sublimated replace it with a new slab. Keep extra dry ice in an ice chest. Because dry ice is frozen CO<sub>2</sub>, it will carbonate open containers. Also anything too close to the dry ice may freeze. Watch out for items below the bottom shelf as they may freeze too.

## DISPOSAL

When finished with the dry ice, unwrap and leave it at room temperature in a well-ventilated area. It will sublimate from a solid to a gas. **DO NOT leave dry ice unattended.**

If you have any questions, please contact **FIU EH&S at (305) 348-2621** or [ehs@fiu.edu](mailto:ehs@fiu.edu).