

Policy & Procedure

Title:	Safe Handling of Dry Ice	Date of Origin:	12/20	Policy #	S91		
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Affiliate(s):	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Hospital: <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Clifton Springs <li style="padding-left: 20px;"><input checked="" type="checkbox"/> NWCH <li style="padding-left: 20px;"><input checked="" type="checkbox"/> RGH <li style="padding-left: 20px;"><input checked="" type="checkbox"/> UMMC <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Unity <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Unity Specialty Hospital <input checked="" type="checkbox"/> Hospital Subcategories: <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Inpatient Services <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Outpatient Services <li style="padding-left: 20px;"><input checked="" type="checkbox"/> ElderOne (ext. clinics) <li style="padding-left: 20px;"><input checked="" type="checkbox"/> PCASI <li style="padding-left: 20px;"><input checked="" type="checkbox"/> SMS <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Behavioral Health <input checked="" type="checkbox"/> Long Term Care <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Clifton Springs Nursing Home <li style="padding-left: 20px;"><input checked="" type="checkbox"/> DeMay Living Center <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Edna Tina Wilson Living Center <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Hill Haven <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Park Ridge Living Center <li style="padding-left: 20px;"><input checked="" type="checkbox"/> Unity Living Center <input checked="" type="checkbox"/> ACM Laboratory <input checked="" type="checkbox"/> Ambulatory Surgery Centers <input checked="" type="checkbox"/> Elder One – PACE <input checked="" type="checkbox"/> NonArticle 28 Practices (WNY) <input checked="" type="checkbox"/> PRCD, Inc. <input checked="" type="checkbox"/> RMHC <input checked="" type="checkbox"/> Lifetime (Homecare and Hospice) <input checked="" type="checkbox"/> Lifetime Pharmacy <input checked="" type="checkbox"/> Homecare Plus
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For purposes of this policy, “Rochester Regional Health” shall collectively refer to the affiliates identified in the header of the policy except those outside the U.S.

Policy Statement: This policy is intended to educate staff on safe handling, storage, transport and use of dry ice.

Procedure:

Introduction

Dry ice is a solidified form of Carbon Dioxide (CO₂), which is normally a gas at room temperature. Unlike regular ice, which freezes at temperatures of 32°F (0°C) dry ice is *extremely cold*, freezing at -109°F (-79°C) which is easily *cold enough to cause frostbite to exposed skin within seconds of exposure*.

Dry ice does not melt as it warms, it sublimates (changes directly from solid to gas), releasing CO₂ gas. CO₂ takes up much, much more space as a gas than it does as a solid, so very high pressures can build up over time if the gas is not allowed to escape from its container.

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Carbon dioxide gas is substantially heavier than air, which means it will flow downhill, like water, and can accumulate in low-lying spaces. In small, poorly ventilated spaces CO₂ gas can displace the normal air and the oxygen in it, leading to an oxygen-deficient atmosphere. Low oxygen levels can have serious health effects, or even be deadly if the deficiency is severe enough.

Emergency Response Guidance

In the event of an emergency, follow the guidance below.

Warn others and leave the area immediately if you experience headache, nausea, restlessness, difficulty breathing, or malaise. Move away from the dry ice to an area with fresh air. Seek medical advice immediately.

Immediately remove anyone who has lost consciousness or has an apparent altered mental state. Move them away from the dry ice to an area with fresh air. Immediately call for emergency medical assistance.

In the event of skin contact immediately remove the source of contact (for example pellets that have entered the cuff of a glove). Do not rub the affected area. Do not apply heat to the affected area. Seek medical guidance immediately as tissues may be frozen.

Safe Handling and Use of Dry Ice



Contact Hazard: At -109 °F (-79 °C), skin contact with dry ice can lead to severe frostbite; skin cells freeze and become damaged very quickly.



Asphyxiation Hazard: Dry ice will sublime (change from solid to gas) at any temperature above -109 °F. This releases potentially substantial volumes of CO₂ (1 pound solid = 250 liters gas), which can displace oxygen quickly in the air around the dry ice, causing dizziness, headaches, difficulty breathing, loss of consciousness and death. This is especially of concern in nonventilated or confined spaces.

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Overpressurization Hazard: Due to the rapid emission of large volumes of CO₂ gas, any dry ice that is stored in a closed container can pressurize the container. Given enough time at normal room temperature, such a container may violently rupture if the gas is not able to escape.

- **Avoid contact with skin or eyes and Never handle dry ice with bare hands**

Never handle dry ice with bare hands. Always wear insulated gloves when handling dry ice. Safety glasses or better yet, a face shield, long-sleeved shirt, long pants and shoes are also recommended. Never handle dry ice with typical exam gloves. They will not protect your skin and may freeze and adhere to your skin, causing additional tissue damage.

- **Do not ingest dry ice**

If dry ice is accidentally ingested, it can cause severe internal injury. Never put dry ice in beverages to cool them.

- **Keep dry ice out of the reach of children**

Only trained adults should handle dry ice. Do not take dry ice home as a toy. Keep dry ice in secured areas at all times to prevent access by untrained staff or the general public.

- **Obtain dry ice in the form and size in which it will be used.**

Never saw a block of dry ice; never use a hammer to break a block of dry ice into smaller pieces. Small chunks of dry ice could be flung into your eyes, onto your skin, or inside openings in your clothing. Other people near by might also be put in danger.

- **Do not transport dry ice in the passenger compartment of a vehicle.**

Dry ice can be safely transported without special ventilation in a physically separated, closed cargo area of a truck or van if all occupants are restricted to the cab. When opening a closed cargo area containing dry ice, allow the closed space to ventilate before entering.

Dry ice can be transported in the trunk of a passenger vehicle. Leave windows open for fresh air circulation. Never leave dry ice in a parked passenger vehicle.

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Sublimation of dry ice in a closed passenger vehicle can result in the accumulation of dangerous concentrations of suffocating carbon dioxide gas.

- **Never store dry ice in glass containers, or any sealed, airtight container**

Storage in a sealed container will allow gas pressure to build and can result in a sudden rupture or explosion of the container from over-pressurization. The force from this can be significant!

- **Do not use or store dry ice in small spaces without ventilation.**

Dry ice releases heavy carbon dioxide vapor that can displace oxygen in the air and cause rapid hypoxia and eventual suffocation.

- **Do not place dry ice on a tile or laminate countertop or floor.**

Dry ice is sometimes used in tile removal and may destroy the bonding agent holding the tile or laminated material in place, or may even cause certain types of tile to fracture suddenly without warning.

Disposal of Unused Dry Ice

- **Do not dispose of dry ice in sewers, sinks or toilets**
The extreme cold of dry ice may harm plumbing and fixtures that aren't designed for it.
- **Do not dispose of dry ice in garbage receptacles or garbage chutes.**
- **Do not dispose of dry ice in areas accessible to the general public**
- **Dispose of dry ice by placing it in a loosely closed container in a well ventilated area and allowing it to sublimate.**

Some examples of appropriate disposal methods may be allowing the dry ice to sublimate outside in a controlled access (no expected general public access) area, or allowing it to sublimate on a loading dock outside the dock doors.

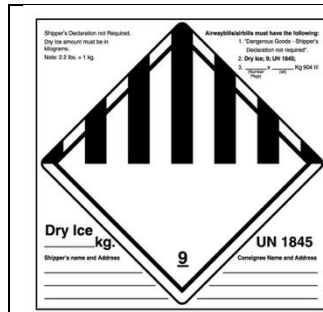
Shipping Dry Ice

Dry ice is considered a hazardous material for shipping purposes. Therefore shipping dry ice via a common ground carrier or through air transport requires special labeling

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and packaging. Consult with the specific carrier for guidance on Federal requirements and carrier-specific requirements. In general dry ice shipments must be marked as in the example below.



DOT Class 9, miscellaneous hazardous material shipping label with specific UN hazard identifier 1845 and common shipping name “Dry Ice.”

Estimating “Safe” Quantities of Dry Ice in an Enclosed Space

A way to estimate the “safe” volume of dry ice in storage or during disposal is by using the following formulas.

For pelletized dry ice in insulated shipping containers where: X = total acceptable pounds of dry ice in a space, V = volume in cubic feet of the room where the dry ice is located, and ACH = air changes per hour

$$X = [(.005)(V)(ACH)]/0.176$$

For pelletized fry ice exposed to the open air at room temperature where: X = total acceptable pounds of dry ice in a space, V = volume in cubic feet of the room where the dry ice is located, and ACH = air changes per hour

$$X = [(.005)(V)(ACH)]/1.76$$

It is important to *note the position of the decimal point* in the denominator as the difference between these two equations. Failing to properly place the decimal point will result in an incorrect value that may place you or others at risk,

It is also important to keep in mind that these calculations are estimates and that all precautions must be followed even if the amount of dry ice present appears to be “safe” according to the calculations.

References:

Sublimation Rate of Dry Ice Packaged in Commonly Used Quantities by the Air Cargo Industry, Federal Aviation Administration, August 2006

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Carbon Dioxide, NIOSH Pocket Guide to Chemical Hazards, National Institute of Occupational Safety and Health, October 2019

Laboratory Safety Guideline Dry Ice (Carbon Dioxide, Solid), Harvard Campus Services Environmental Health and Safety, November 2019

Dry Ice, Carbon Dioxide, Solid, Safety Data Sheet, Praxair, August 2016

Carbon Dioxide, Solid or Dry Ice, Safety Data Sheet, Airgas, November 2018

Approvals	<u>Signature</u>	<u>Name</u>	<u>Title</u>	<u>Date</u>
		Robert Mayo, MD	EVP, Chief Medical Officer	12/2020