DRY ICE

EDUCATION MODULE

Created: Beaumont Laboratory Education Committee, June 2013
Approved: Beaumont Laboratory Safety Committee, August 2013

Objectives

- Upon completion of the module, participants will be responsible to state the following:
  - What dry ice is
  - Definition of sublimation
  - Dry ice uses
  - The signal word for dry ice
  - Dangers associated with dry ice
  - Requirements for dry ice:
    - PPE and other handling
    - Package and shipping
    - Transportation, storage and disposal
  - First aid measures for dry ice exposure

What Is Dry Ice?

- Dry ice is the white solid, frozen form of carbon dioxide (CO_2).

- May also be referred to as “Cardice” or “Card Ice” (British English).

Dry Ice Sublimation

- Dry ice gets its name because it sublimes, meaning the solid form changes directly to an odorless gas without going through a liquid phase.

- Unlike regular ice that leaves a water residue as it melts, dry ice leaves no residue due to sublimation.

Uses for Dry Ice

- Dry ice has commercial, industrial and scientific uses.

- In the laboratory, dry ice is used to keep specimens cold during transport between locations.

Signal Words

- OSHA, in conjunction with the newly Globally Harmonized System of Classification and Labeling of Chemicals (GHS), has identified signal words to be used in conjunction with chemicals.

- A signal word is a single word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on a *label or safety data sheet (SDS)*.

Signal Words

- The signal words used are "danger" and "warning.“
  - “Danger" is used for the more severe hazards.
  - “Warning" is used for less severe hazards.

- The signal word for dry ice is “***Danger***.”

Dangers Associated with Dry Ice

- This material is EXTREMELY COLD!! (−109°F; −78°C).
- Do NOT touch dry ice directly.
- Avoid eye and skin contact.
- Can cause burns such as frostbite.

Dangers Associated with Dry Ice

- Vapor Inhalation: Acts as an asphyxiate, meaning it can cause suffocation.
  - CO_2 gas is heavier than air and causes oxygen displacement.
  - Inhalation can:
    - Increase respiration & heart rate.
    - May cause dizziness & drowsiness.
  - A small amount of dry ice will sublime (evaporate) into a large volume of CO_2 gas.

Required PPE When Handling Dry Ice

- Personal protective equipment (PPE) that **MUST** be worn include:
  - Insulated, cryogenic gloves .
  - A face shield, especially if breaking or chipping a block of ice.
  - Long sleeve disposable gown (no open skin).

Other Requirements When Handling Dry Ice

- A scooper must be used to scoop dry ice from a container.
- When placing dry ice in a plastic bag, only handle the bag by the drawstring.

Other Requirements When Handling Dry Ice

- NEVER seal a container airtight if it will house dry ice because pressure will build up and may lead to an explosion.

- Avoid using in confined spaces such as walk-in refrigerators or rooms without ventilation.

Handling Procedure

1. Obtain PPE and scoop.

2. Open dry ice storage container by unlatching the rubber holder.

3. Place dry ice with the scoop into a plastic drawstring bag and then into a thermal insulated container to carry from location to location.

Handling Procedure

4. When finished, replace the scoop, close the storage unit and re-latch it. Be sure that the container is secured so that the dry ice does not sublime.

5. Place PPE and scoop back in the proper location.

6. Carry cooler from the bottom.

Handling Procedure

- Note: Plastic drawstring bags with dry ice must be placed in a thermal insulated cooler when transporting from vehicle to building and vice versa.

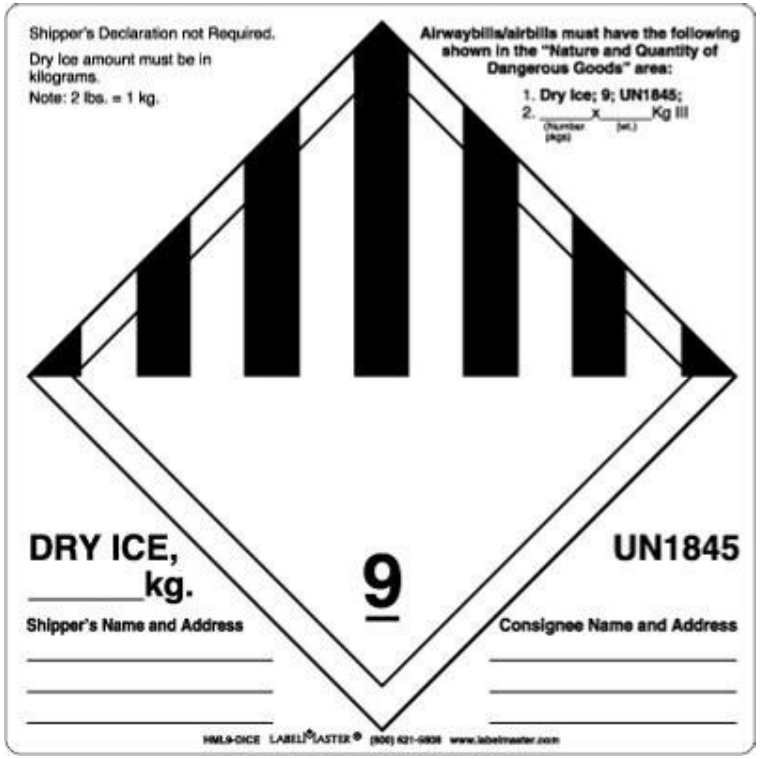
- Bags may not be carried “loose.”

Packaging/Shipping Requirements

- Dry ice is a hazardous material.
- The U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA) regulate shipments.
- Specific procedures must be followed when packaging and shipping materials with dry ice.
- Specific training and certification are required for personnel packaging and shipping dry ice.

Packaging/Shipping Requirements

- When shipping dry ice, the outer package **MUST** contain a class 9 hazard label (shown below).



Transportation Requirements

- Hazardous labels must also be placed on coolers containing dry ice that are utilized by Beaumont Laboratory Couriers when transporting specimens between Beaumont campuses or client offices. (See below.)

Transportation Requirements

- The plastic drawstring bags with dry ice must be placed in a thermal insulated cooler when transporting dry ice from vehicle to building and vice versa. Bags may not be carried "loose."
  - Ensure the dry ice container is well insulated.
  - Make sure the vehicle has adequate ventilation.
  - Make sure fresh air is circulating from OUTSIDE the vehicle.
  - If possible, open windows.

Storage Requirements of Dry Ice

- When storing and using dry ice, one must have adequate VENTILATION!

- NEVER store dry ice in glass or other sealed containers.
  - Coolers are NOT considered air tight.

- Store dry ice in *insulated* containers.

Accidents/Spills

- Wear PPE.
- Scoop up: do not pick up with bare hands.
- Follow waste disposal requirements.

Disposal Requirements of Dry Ice

- Disposal must be controlled.

- Do NOT place dry ice directly on the floors or in sinks or on counters.
  - May crack them.
  - May remove the adhesive.

Disposal Requirements of Dry Ice

- Leave the dry ice container open, in a WELL VENTILATED area to sublimate.

- Do NOT evaporate in a hood.
  - The impacts are unknown to the ventilation system .
  - It is unknown where the exhaust comes out of the building.

- NEVER dispose of dry ice in the environment or where there is access to passers-by.
  - Example: grassy areas on hospital or other property.

First Aid

- In case of inhalation exposure to dry ice:
  - Move to a location with fresh air.

- If there is physical contact to dry ice:
  - Remove any clothing that is not frozen to the skin.
  - Do NOT rub frozen body parts because tissue damage may result.
  - Obtain medical assistance as soon as possible.

Conclusion

- This completes the dry ice module.
- Questions or concerns regarding dry ice should be discussed with your section supervisor or site Safety/Chemical Hygiene Officer.

References

- OSHA Quick Facts: Laboratory Safety; Cryogens and Dry Ice http://www.osha.gov/Publications/laboratory/OSHAquickfacts-lab-safety-cryogens-dryice.pdf
- OSHA: A Guide to The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) http://www.osha.gov/dsg/hazcom/ghs.html
- Wikipedia: Dry Ice http://en.wikipedia.org/wiki/Dry_ice

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