

Guideline for Shipping Items¹ on Dry Ice That are Not Dangerous Goods

INTRODUCTION

Dry ice is a hazardous material; therefore the U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA) regulate shipments containing dry ice. This guideline describes how non-dangerous goods with dry ice are to be packaged for using Federal Express (in accordance with IATA Dangerous Goods Regulations). This guideline applies only to items shipped with dry ice that are not otherwise dangerous goods (e.g., are not flammable, infectious, toxic, diagnostic specimens, oxidizers, reactive, etc.).

For the purposes of this guideline, the term 'inner package' refers to the container holding the materials being shipped (such as a vial, bottle, etc.). The term 'outer package' refers to the container holding and protecting the inner package (usually a cardboard box).

REQUIRED TRAINING for SHIPPING DRY ICE

All shippers of dangerous goods (including dry ice only packages) are required by law to have applicable training. This document serves only as a guideline and does not constitute training. For that reason, it is highly recommended that you have your package inspected and the Airbill completed by a trained DRI employee. To make those arrangements, complete the DRI Dangerous Goods Shipping Request Form (insert URL). Penalties for non-compliance with shipping regulations can be significant. In addition to potential public safety implications, each violation of the regulations may result in a civil penalty of up to \$30,000. A violation can result in five years imprisonment and penalties of \$250,000. Persons who willfully violate the regulations may be subject to criminal prosecution with penalties of up to \$500,000 and/or five years imprisonment.

HAZARD IDENTIFICATION

Dry ice is classified by DOT and IATA as a 'miscellaneous' hazard, class 9 (see Table 1). Dry ice is considered hazardous during transportation for three reasons:

1. **Explosion hazard:** dry ice releases a large volume of carbon dioxide gas as it sublimates. If packaged in a container that does not allow for the release of the gas, it may explode, causing personal injury or property damage.
2. **Suffocation hazard:** a large volume of carbon dioxide gas emitted in a confined space may create an oxygen deficient atmosphere.
3. **Contact hazard:** dry ice is a cryogenic material that causes severe frostbite upon contact with skin.

¹ This guideline applies when your shipment contains *no hazardous material OTHER THAN dry ice*. If you are not sure about the applicability of these guidelines, please contact NNSC Shipping and Receiving (DGshipping@dri.edu) prior to preparing your shipment. Packages refrigerated with dry ice are normally shipped by air in order to reach their destinations rapidly. Therefore this guide only pertains to air shipments of dry ice only packages. If you want to ship your packages by other means (ground, freight, vessel, etc), please contact DGshipping@dri.edu to discuss applicable shipping regulations.

Table 1-- IATA Classification of Dry Ice (Section 4.2)

Proper Shipping Name	CARBON DIOXIDE, SOLID or Dry Ice
UN/NA Identification Number	UN 1845
Class or Division	9
Hazard Label	Miscellaneous
Packing Group	III
Packing Instructions	904 (IATA Section 5)
Maximum Quantity/Package for Limited Quantity	_____
Passenger/Cargo Aircraft	200 Kg
Cargo Aircraft Only	200 Kg
Special Provisions	A48 (package test not required)

PACKAGING DRY ICE

Packaging dry ice properly will minimize the risk to personnel transporting the material. The explosion hazard will be eliminated with a package designed to vent gaseous carbon dioxide. Suffocation and contact hazards will be greatly reduced by labeling the package correctly, so those who come in contact with it will be aware of the contents.

Per IATA packaging instruction 904, inner and outer packages must be of good quality. Dry ice does not require specification packaging, but the general provisions described below must be observed

1. For liquids in inner packages, closures (caps, lids) must be held secure by positive means, such as tape. Expansion of liquids must be considered due to temperature and elevation changes. Containers of liquids must have sufficient ullage (headspace) to allow for expansion. This is not a consideration if the container is specifically designed not to have ullage (as in volatile organic sample containers).
2. The dry ice must be in outer packaging designed and constructed to permit the release of carbon dioxide gas that forms, preventing the build-up of pressure that could rupture the packaging. This can be done by not taping all the seams between the dry ice and the outer packaging.
3. Arrangements between the shipper and transporter must be made for each shipment to ensure ventilation safety procedures are followed. For Federal Express, completing the USA Airbill will satisfy this requirement.
4. Inner packaging must be packed, secured, or cushioned to prevent breakage or leakage.
5. Absorbent material is not required.
6. Orientation labels (Up Arrows) are not required.

MARKING (IATA, Section 7.1)

1. All package markings must be in English.
2. All markings must be durable and in the correct location.
3. Abbreviations are not acceptable unless otherwise specified in the regulations.
4. Only relevant markings are allowed on the outer package. All other markings must be obliterated.
5. The outer package must be of such a size that there is adequate space to affix all required markings and labeling (see IATA 5.0.2.13.4).
6. The package must be marked with the following information (See Packing Use Marking, IATA 7.15):
 - Proper shipping name: CARBON DIOXIDE, SOLID or Dry Ice. (Either name is acceptable).
 - UN Identification Number: UN 1845
 - The full name and address of the shipper and consignee (location where it is being shipped)

- The net weight of Carbon Dioxide, Solid must be marked on the outside of the package. The weight must be in Kilograms. (2.2 pounds = 1 Kg)

LABELING (IATA Section 7.2)

1. The outer package must be of sufficient size to affix all labels.
2. Only relevant labels are allowed on the outer package. All other labels must be removed or obliterated.
3. All labels must be durable, in correct location and secure.
4. For Carbon Dioxide, Solid, a Class 9 label is required. This label must be designed and sized as specified in IATA 7.2.2.3. The proper labels (see Attachment A, figure 1) are available at both the NNSC and SNSC shipping and receiving desk.
5. The label must not be folded or affixed in a manner that parts of the same level appear on different sides of the outer package.
6. Labels should be affixed on the package adjacent to the shipper or consignee's address (See example of a completed package configuration in Attachment A, figure 2).

DOCUMENTATION:

Most shipments of dangerous goods must be accompanied by two shipping documents: a "USA Airbill" and a "Shipper's Declaration for Dangerous Goods", however the latter is not required for dry ice only packages so the "Nature and Quantity of Goods" on the Air Waybill must show

- Proper Shipping Name
- Hazard Class or Division Number
- UN or NA Identification Number
- Number of Packages
- New quantity (in Kg) per package)

ADDITIONAL RECOMMENDATIONS for DRY ICE SHIPMENTS

1. Do not write 'specimens' or 'diagnostic specimens' on the box. Diagnostic specimens are subject to specific packaging requirements and there should not be any misunderstanding about your shipment. Diagnostic specimens, in shipping terminology, are materials that may be infectious to humans or animals. If you think your samples might be infectious, refer to the Biological/Select Agents Shipments ([add link](#)).
2. Reusing a dry ice box can be a good use of resources. If you choose to reuse a box, completely obliterate all unnecessary marking, such as hazard labels, addresses, FedEx (or other courier) labels and barcodes. Use caution if reusing a box that has been used to ship infectious material or diagnostic specimens. Only reuse a box if you can personally verify it is not contaminated and its integrity is intact. A box should not be reused if it is torn, cut, stained, or if the insulation is cracked or broken.
3. Secure your samples in such a way that when the dry ice sublimates, they will not move freely inside of the insulated box. This can be accomplished by wedging your samples in place with cardboard or Styrofoam. Fragile containers such as glass tubes or vials should be wrapped with cushioning material.
4. Minimize the volume of air to which the dry ice is exposed. This will slow the rate of sublimation. If there is any air space after you fill your package with dry ice, fill it with packing peanuts or crumpled paper.

5. Shipments are generally recommended to contain 5-10 pounds (2.27-4.54 kg) of dry ice per 24 hours. Refer to your package manufacturer's recommendations. Make arrangements with your consignee to make sure your package will be received on its intended delivery date. Take into account local holidays or closings that might delay package receipt.
6. Dry ice shipments can be made with FedEx. UPS and the U.S. Postal Service have extremely restrictive policies concerning the shipment of hazardous materials; do not ship dry ice with UPS or the U. S. Postal Service.

Attachment A

Figure 1—Examples of acceptable labels for dry ice shipments (not to specified size)

Class 9—Miscellaneous Label

Dry Ice Label

Figure 2—Example of a properly labeled and marked outer package containing non-dangerous goods with dry ice

Shipper: P.I. Scientist NNSC 55 Parkway Ave. Anytown, NV 89555
Ship To: Research Whiz SNSC 55 El Camino St. My Town, CA 98525
Carbon Dioxide Solid * UN 1845 2 Kg

*Delete the information in this box of information if using dry ice label shown in Figure 1 above.