I. Purpose

Dry ice is a hazardous material and as such it is regulated for shipment by the United States Department of Transportation (USDOT) and the International Air Transport Association (IATA). Regulations require that specific procedures must be followed when shipping dry ice.

This guide outlines the procedure to follow when your shipment includes no hazardous materials other than dry ice. If you are not sure if the material you are shipping is considered hazardous, contact Adam Peters at 982-4908, adam@virginia.edu. When shipping biological materials, please contact Ericka Pearce at 982-5005, eep3p@virginia.edu.

Packages refrigerated with dry ice are normally shipped by air in order to reach their destinations rapidly. Therefore, information in this guide pertains to air shipments of dry ice only. If you intend to ship your package by other means such as ground, freight, vessel, etc., contact EHS to discuss applicability of shipping regulations.

II. Training Requirements

Federal law requires that anyone wishing to ship dry ice (or any other hazardous material) must have appropriate training. If you wish to prepare or offer a package containing dry ice for shipment, you must first follow the training certification requirements outlined here:

1. Read this guide. This guide will explain the general provisions relating to the regulations and detailed training in the requirements applicable to dry ice.
2. Complete the Intent to Ship Dry Ice form (Appendix A) and submit it to EHS. EHS will review this form and, upon successful completion, will certify you to ship dry ice.

Shipping regulations change frequently, so it is necessary to renew your certification every two years.

III. Hazard Identification

Dry ice is classified by DOT and IATA as a “miscellaneous” hazard, class 9. Dry ice is considered hazardous for three reasons:

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

Following the procedures outlined in this guide will minimize risk for all during transportation. With a package designed to vent gaseous carbon dioxide, the explosion hazard will be eliminated, and by labeling the package properly and declaring the HazMat shipment, the suffocation and contact hazards will be greatly reduced.
IV. Packaging Dry Ice

A. Requirements

There are five basic requirements for shipments of dry ice:

1. **Venting of gas**: packages must allow for the release of carbon dioxide gas. Dry ice must never be sealed in a container with an airtight seal.

2. **Package integrity**: a package containing dry ice must be of adequate strength for its intended use. It must be strong enough to withstand the handling normally encountered in transport. It must also be constructed and closed in order to prevent any loss of contents that might be caused by vibration or by changes in temperature, humidity, or altitude.

3. **Package materials**: do not use plastics that can be rendered brittle or permeable by the temperature of dry ice. This problem can be avoided by using commercially available packages intended to contain dry ice, see Appendix B, Manufacturers of Dry Ice Shipping Containers.

4. **Airbill**: the airbill (also referred to as the air waybill) must include the statement “Dry ice, 9, UN1845, number of packages X net weight of dry ice in kilograms.” FedEx has a check box on their airbill to satisfy this requirement; see Figure 2. Airborne Express requires a slightly different format; see Figure 3. Check with your courier to make sure you have made the proper notation on their paperwork.

5. **Labeling**: the outermost container must be labeled with a hazard class 9 label, the words “UN 1845, Dry Ice”, and the net weight of dry ice in kilograms. See Figure 1. These labels are available through EHS and a printable version is included in Appendix C. The label should be affixed to a vertical side of the box (not the top or bottom) and oriented as in Figure 1. The maximum allowable net quantity of dry ice allowed per package is 200 kg.

![Figure 1. Dry ice label.](image-url)
Figure 2. FedEx Airbill. Highlighted area properly documents 1 box containing 6 kg of dry ice.

Figure 3. Airborne Express Airbill. Highlighted area shows format required for 1 box containing 5 kg of dry ice.
B. Recommendations

Note the following recommendations when packaging and labeling dry ice shipments:

- 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, please contact Ericka Pearce at 982-5005, eep3p@virginia.edu.

- Reusing a dry ice shipping box is a good use of resources. If you choose to reuse a box, completely cover or obliterate all unnecessary marking such as hazard labels, addresses, old FedEx (or other courier) labels and/or barcodes. 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.

- Secure your samples in such a way that when the dry ice sublimes, 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.

- Minimize the volume of air to which the dry ice is exposed in order to 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 other material to reduce the volume of air space.

- 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.

- Dry ice shipments can be made with FedEx and DHL. UPS and the U.S. Postal Service have extremely restrictive policies concerning shipments of hazardous materials; EHS recommends that you do not ship dry ice with UPS or the U.S. Postal Service.
Appendix A. Intent to Ship Dry Ice

After reading the UVA Guide to Shipping with Dry Ice, complete the following exam. EHS will review the completed form and, upon successful completion, will certify you to ship dry ice. The certification will expire after two years.

1) Why is dry ice considered a hazardous material?

2) Which of the following labels/markings must appear on a package containing dry ice? Check all that apply.

- □ Class 9 hazard label
- □ Class 8 hazard label
- □ “Class 8 hazard label”
- □ “Inner packages comply with prescribed specifications”
- □ “Net weight of dry ice”
- □ “UN1845, Dry ice”
- □ Biohazard symbol
- □ “Diagnostic specimens”

3) A class 9 label must be put on a package only when there are other hazardous materials in the box in addition to dry ice.
   a) True
   b) False

4) It is acceptable to put a class 9 label on the top or bottom of the box.
   a) True
   b) False

5) The only consideration when reusing a dry ice shipping box is labeling it with the correct address.
   a) True
   b) False

6) If you are shipping non-hazardous plant tissue samples to a lab for diagnostic analysis, the statement, “Diagnostic specimens enclosed,” should be written on the package.
   a) True
   b) False

I understand the hazards associated with dry ice and the shipping requirements for dry ice, as outlined in this manual.

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Please return in messenger mail to EHS, Box 400322, c/o Adam Peters.
Appendix B. Manufacturers of Dry Ice Shipping Containers

Air Sea Atlanta
1234 Logan Circle
Atlanta, GA 30318
(880) 351-8600
http://www.airseaatlanta.com

All-Pak, Inc.
Corporate One West
1195 Washington Pike
Bridgeville, PA 15017
(800) 245-2283
http://www.all-pak.com

CARGOpak Corporation
3215-A Wellington Court
Raleigh, NC 27615
(800) 266-0652
http://www.cargopak.com

DG Supplies, Inc.
5 Boxal Drive
Cranbury, NJ 08512
(800) 347-7879
http://www.dgsupplies.com

HAZMATPAC, Inc.
5301 Polk St., Bldg. 18
Houston, TX 77023
(800) 923-9123
http://www.hazmatpac.com

Inmark, Inc.
220 Fisk Drive S.W.
Atlanta, GA 30336-0309
(800) 646-6275
http://www.inmarkinc.com

Polyfoam Packers Corporation
2320 S. Foster Avenue
Wheeling, IL 60090
(888) 765-9362
http://www.polyfoam.com

SAF-T-PAK, Inc.
10807-182 Street, Edmonton
Alberta, Canada, T5S 1J5
(800) 814-7484
http://www.saftpak.com

Source Packaging of New England, Inc.
405 Kilvert Street
Warwick, RI 02886
(800) 200-0366
http://www.sourcepak.com
Appendix C. Dry Ice Shipping Label

The label below should print with the proper dimensions of a class 9 hazard label (minimum dimensions: 100 mm on a side). Cut around the outside border of the label and affix it to a vertical side of the box (not the top or bottom), oriented as shown below. Many printer inks run when exposed to even small amounts of water, such as rain or snow. Therefore, when using this label, cover with clear plastic tape after filling in the weight of dry ice.

![Dry Ice Shipping Label Diagram]

**NOTICE**

If the quality of the fax or photocopy is not the same specification as the regulation, you may be in violation of the transportation standards.

Cut out the label and place it on the package with clear package tape. Completely cover the label to make it durable and weather resistant.

Check the dry ice box on the airwaybill and include the number of packages and the kg amount per package (under the special handling section).

The label illustrated must be displayed on the external surface of the outer packaging on a background of a contrasting color and must be clearly visible and legible. Each side of the label must have a length of 100 mm, unless the package contains an infectious substance and the dimensions are such that it can only bear a smaller label not less than 50 mm.

**DISCLAIMER:** These materials are provided as a courtesy, to be used as guidelines to assist properly trained shippers. These materials do not alter, satisfy, or influence any federal or state requirements. The contents of these materials are subject to change due to constant changes in government regulations. FedEx Express accepts no liability for loss or damage resulting from changes, errors, omissions, or misinterpretations of these materials.

![Dry Ice UN 1845 Label Diagram]