Solid carbon dioxide or dry ice, is commonly used during transit as a refrigerant to keep materials cold. Shipments containing dry ice pose several hazards during transit, including a risk of explosion, suffocation and tissue damage. Dry ice is therefore regulated as a “dangerous good” by the International Air Transport Authority (IATA) and the Department of Transportation (DOT). To mitigate these hazards, several precautions must be taken when offering packages containing dry ice for shipment.

Hazardous materials shipments may require additional packaging and labeling. Shipments of using dry ice as a refrigerant have:
- identification number UN 1845
- proper shipping name of “Carbon Dioxide, solid B” or “Dry Ice”
- Accordance with Packing Instruction 954 (can be found in Appendix E)

These are the basic requirements for shipments of dry ice:

1. **Gas venting**: packages must allow for release of carbon dioxide gas. Dry ice must never be sealed in a container with an airtight seal such as a jar with a threaded lid or a plastic cooler. Pack dry ice loosely in the outer package such as a Styrofoam shipping package. Check the manufacturer’s list (Appendix A) for prefab packaging.

2. **Package integrity**: a package containing dry ice must be of adequate strength for intended use. It must be strong enough to withstand the loading and unloading 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. *(See Figure 4)*

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 manufacturer’s list (Appendix A) (ex.: Saf-T-Pak STP 310 or Source Packaging INF-5000).

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 in kilograms.” FedEx has a check box on their airbill to satisfy this requirement; see Appendix C, figure C.1. Airborne Express requires a slightly different format; see Appendix C, figure C.2. Check with the courier to obtain or ensure proper completion of their paperwork.

5. **Marking the package.** The shipping container must be marked with the following (Place two labels, one on each opposite side of box):
   a) “Carbon dioxide, solid” or “Dry Ice”, UN1845 in this order and in English;
   b) The FULL name and address of the shipper and consignee (where/who it is being shipped);
   c) The net quantity of dry ice within each package in kilograms.

6. **Labeling**: the outermost container must be labeled with a hazard class 9 label, UN 1845, and net weight of dry ice in kilograms. A printable version is included in Appendix D. The label should be affixed to a vertical side of the box (not the top or bottom) and oriented as in Appendix D. The maximum allowable net quantity of dry ice allowed per package is 200 kg. Place one of these labels on two opposing sides of the box.
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, contact the Pace University EH&S Office.

- **Reusing boxes.** 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.

- **Secure your inner package** in such a way that when the dry ice sublimes, it will not move freely inside of the insulated box. You may want to wedge the package in place with cardboard or styrofoam. Fragile containers such as glass tubes or vials should be wrapped with cushioning material.

- 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 (Refer to FedEx How to Pack manual, pages 11-13 on general information on dry ice use in perishable shipments.) and DHL. UPS and the U.S. Postal Service have extremely restrictive policies concerning shipments of hazardous materials; do not ship dry ice with UPS or the U.S. Postal Service.**

EH&S Contact Information:

Phone: (914)923-2818  Fax: (914) 330-2795

Appendix: 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

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

Package examples:

SAFT-T-PAK: STP 3100

Source Packaging: INF-5000
Appendix B: Sample image of typical Dry Ice Shipping Container.

The typical Dry Ice shipping container features an internal foam core with cardboard box exterior. **DO NOT tape the Styrofoam top or the box top on tightly. Taping should be secure but NOT air tight.**
Appendix C: Sample Airbill or Air Waybill

Figure C.1. FedEx Airbill. Highlighted area properly documents 1 box containing 6 kg of dry ice.

Figure C.2. Airborne Express Airbill. Highlighted area shows format required for 1 box containing 5 kg of dry ice.
Appendix D. 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 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.
Appendix E. PACKING INSTRUCTION 954 – Class 9 – Miscellaneous Dangerous Goods

STATE VARIATION: BEG-05 SAG-04 USG-12

OPERATOR VARIATIONS: BD-01 CA-08 CO-09 CS-09 HP-02 IC-08 KE-06 US-02 VN-11

This instruction applies to UN 1845 on passenger and cargo aircraft and CAO. The General Packing Requirements of 5.0.2 must be met.

Carbon dioxide, solid (dry ice) in packages, when offered for transport by air, must be in packaging designed and constructed to permit the release of carbon dioxide gas and to prevent a build-up of pressure that could rupture the packaging.

Arrangements between shipper and operator(s) must be made for each shipment, to ensure ventilation safety procedures are followed.

The Shipper’s Declaration requirements of Subsections 8.1 and 10.8.1 are only applicable when the Carbon dioxide, solid (dry ice) is used as a refrigerant for dangerous goods that require a Shipper’s Declaration.

When a Shipper’s Declaration is not required, the following information, as required by 8.2.3 for the Carbon dioxide, solid (dry ice), should be contained in the “Nature and Quantity of Goods” box on the air waybill:

- UN 1845;
- proper shipping name (Dry ice or Carbon dioxide, solid);
- Class 9;
- the number of packages; and
- the net quantity of dry ice in each package.

The net weight of the Carbon dioxide, solid (dry ice) must be marked on the outside of the package.

Dry ice used as a refrigerant for other than dangerous goods may be shipped in a unit load device or other type of pallet prepared by a single shipper provided that the shipper has made prior arrangements with the operator. In such case, the unit load device, or other type of pallet must allow the venting of the carbon dioxide gas to prevent a dangerous buildup of pressure. The shipper must provide the operator with written documentation stating the total quantity of the dry ice contained in the unit load device or other type of pallet.

Notes

1. Refer to the relevant airline’s loading procedures for Carbon dioxide, solid (dry ice) limitations.
2. For Air Waybill requirements see 8.2.3. For loading instructions see 9.3.12.
3. For cooling purposes, an overpack may contain Carbon dioxide, solid (dry ice), provided that the overpack meets the requirements of Packing Instruction 904.