

## **Transportation and Safe Handling of Dry Ice**

### **1. Introduction**

Dry Ice, the solid form of Carbon Dioxide, is manufactured and sold by many gas producers. Its unique properties pose risks that are quite different than those posed by compressed gases. It is purchased, transported and used by both industrial users and private individuals. MEGA recognizes that the risks of transporting Dry Ice are often underestimated and there exists a potential for harm if these risks are not managed.

### **2. Purpose and Scope**

This document will address safety concerns and suggest guidelines for the safe transportation and handling of Dry Ice.

### **3. Properties of Dry Ice**

- Carbon Dioxide (CO<sub>2</sub>) can exist as either a gas, a liquid or a solid.
- In its solid form it is generally referred to as “Dry Ice” (to differentiate it from water or “wet” ice).
- Dry Ice is a white, opaque substance at a temperature of – 78.5°C .At atmospheric pressure, it transforms directly into CO<sub>2</sub> gas (sublimes without going through the liquid phase).
- The resultant gaseous Carbon Dioxide gas is colourless, odourless and approximately 1.5 times heavier than air. A slightly acid gas, it has a slightly pungent odour and biting taste. It is non-reactive and non-toxic. It will not burn and will not support combustion or life.
- Dry Ice is produced by letting liquid CO<sub>2</sub> expand , and compressing the resultant ‘snow’ into blocks or slices, or extruding it through dies to produce pellets ( ‘nuggets’ or ‘rice’ ) of various dimensions.

### **4. Uses of Dry Ice**

Dry ice is commercially used to refrigerate dairy products, meat, frozen foods or other perishable food while in transit. It is also used as a cooling agent, in processes such as rubber tumbling, grinding heat-sensitive material, vacuum cold traps, shrink-fitting of machinery parts, and may take the place of shot or sand for blast-cleaning sensitive materials. It is recreationally used in entertainment applications (to produce ‘smoke’), science applications and demonstrations in schools, and by hunters and fishermen to freeze their catch, just to name a few.

## 5. Hazards of Dry Ice

The same properties that make Dry Ice so useful also pose some of the hazards.

### 5.1 Extreme Cold

- The temperature of Dry Ice is  $-78.5^{\circ}\text{C}$ . It must never be handled by bare hands. Use heavily insulated gloves, tongs or other mechanical means for handling.
- It must be insulated for shipping, as it will freeze body parts or materials it touches or is placed on.

### 5.2 Pressure Build-up in confined spaces

- No matter how much dry ice is insulated, some heat will reach it and cause it to sublimate.
- Dry Ice must not be stored or shipped in hermetically-sealed containers. Containers must be able to vent  $\text{CO}_2$  buildup.

### 5.3 Inert gas properties

- As explained in 5.2, some dry ice will sublimate under virtually any circumstance. The resultant  $\text{CO}_2$  vapour will be heavier than air, and may displace air in a confined space, leading to an oxygen-deficient atmosphere.
- This can be especially severe in hot weather countries, where people want to maximize the efficiency of their vehicle air conditioning, and thus running the air conditioning systems in 'air recycle' mode while keeping windows closed.

## 6. Dangerous Goods Classification

- Shipping Name : Dry Ice or Carbon Dioxide, Solid
- UN Number : 1845

## 7. Transportation of Dry Ice

### 7.1 Commercial Distribution

- Large quantities of dry ice are shipped in purpose-built insulated boxes. Various designs are available, ranging from open boxes, loosely covered by insulated blankets, to purpose-built wheeled and enclosed boxes.
- Enclosed boxes must be constructed to allow any  $\text{CO}_2$  vapour resulting from sublimation to vent.
- Dry Ice must be protected from heat, wind and dust as much as possible, and is therefore generally shipped in enclosed cargo vans (air-conditioned in hot weather countries).
- $\text{CO}_2$  vapours also naturally attract insects, which may suffocate and contaminate dry ice, so care must be taken where this could be a problem.
- Trucks for the transportation of Dry Ice must have separate cargo and passenger/driver compartments.

- Drivers and delivery personnel must be trained in the safe handling of dry ice, and must be cautious before entering enclosed cargo vans filled with Dry Ice.
- Dry Ice is best stored in dry, well-ventilated spaces. Floor-mounted positive ventilation is preferred.
- Dry Ice should be handled only using heavy gloves. Ice tongs are recommended for large blocks.

## 7.2 Retail Distribution

- Dry Ice should have a minimum level of insulation
  - Large blocks may be wrapped in heavy paper or plastic, or packed into Styrofoam or other insulated boxes
  - Smaller amounts may be contained in bags, or Styrofoam or other insulated boxes.
- Customers should be warned not to re-pack the Dry Ice into closed, airtight containers.
- Customers should be warned not to touch the product with their bare hands and to keep it out of reach of children.
- Customers picking up Dry Ice from production plants in personal vehicles should be advised to keep some windows open, and to not use the 'recycle' setting on the ventilation system during transport of the product. Dry Ice should be separated from passengers as much as possible.
- Suggested wording for a warning sign or label is as follows

SOLID CARBON DIOXIDE (DRY ICE)  
 WARNING ----EXTREMELY COLD (-78 DEG C)  
 Avoid contact with skin and eyes---use gloves  
 Do not taste.  
 Keep out of reach of children.  
 Gas may cause asphyxiation  
 Do not put in closed or airtight containers

## 8. Disposal of Unneeded Dry Ice

Dry Ice for disposal should be placed in a well-ventilated area, free from personnel or vehicular traffic, and allowed to sublime until no solid is left.

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