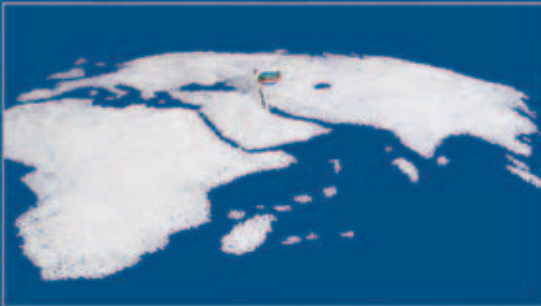




شركة ايكويت للبتروكيماويات  
EQUATE Petrochemical Company



POLYETHYLENE Storage and  
Handling Guide



## Introduction

**EQUATE** Petrochemical Company is a Kuwait-based producer of high-quality Polyethylene (PE) and Ethylene Glycol (EG).

Through a legacy of lasting Strong Bonds with customers and innovative business practices, EQUATE is a joint venture between Kuwait's state-owned Petrochemical Industries Company (PIC), The Dow Chemical Company (Dow), as well as Boubyan Petrochemical Company (BPC) and Qurain Petrochemical Industries Company (QPIC) representing Kuwait's emerging private sector.



Established in 1995, this groundbreaking international joint venture enjoys the advantages of combining Dow's leadership in industrial practices and cutting-edge technology with experienced and highly driven people, valuable infrastructure and feed-stock provided by Kuwait.

To meet ever-increasing worldwide demand for high-quality petrochemical products, EQUATE's shareholders just completed a multi-billion dollar expansion project which greatly increases the production capacities of PE and EG. Emerging as Greater EQUATE, this global-scale venture added Styrene Monomer (SM) to EQUATE's product slate. Paraxylene and Benzene, which are used to manufacture SM, are produced at the same location from a new world scale Aromatics plant which is also operated by EQUATE. EQUATE Petrochemical Company is now the single operator of Greater EQUATE, which includes EQUATE, The Kuwait Olefins Company (TKOC), The Kuwait Styrene Company (TKSC) and Kuwait Paraxylene Production Company (KPPC).



## Polyethylene Storage & Handling Guide

This Polyethylene Storage and Handling Guide is published to help customers safely handle EQUATE polyethylene resin and prevent contamination during unloading operations. The recommendations and procedures covered in the guide, where applicable, should be carefully followed.

## EQUATE Polyethylene Products and Packaging & Shipping Formats

**EQUATE** manufactures High Density Polyethylene (HDPE) and Linear Low Density Polyethylene (LLDPE). Various grades are offered for industrial use to produce films, pipes and molded products.

All PE grades are supplied in pellet form. Bulk density of each grade is different due to variation in mass density and pellet shape. The average bulk density is about  $550\text{Kg/m}^3$ . LLDPE grades differ in their conveying rates due to presence or absence of slippery attributes.

**EQUATE** employs a dense phase system for conveying and transportation within its manufacturing facilities that minimizes dust contamination. However, negligible amount of dust and streamers can be present.





**EQUATE** polyethylene LLDPE and HDPE grades are supplied in bulk or in 25 Kg plastic bags in the following packing and shipping formats:

Packaging Format	Number of Bags	Net Weight, MT
8 layer pallet	40	1.0
11 layer pallet	55	1.375

Shipping Format	Pallet Format	Number of Pallets	Number of Loose Bags	Total Number of Bags	Net Weight, MT
20ft container	-	-	670	670	16.75
40ft container	11 Layers	18	zero	990	24.75
overland truck	11 Layers	18	zero	990	24.75
overland truck	11 Layers	20	zero	1100	27.5
20ft sea bulk container	-	-	-	-	16.5 to 20



## Description of Palletized Packaging

Each palletized packaging unit consists of a wooden pallet base conforming to the International Phytosanitary Measure ISPM 15 of International Plant Protection Convention (IPPC) branded with the seal of compliance.

Standard dimensions of the wooden pallets are 1300mm x 1100mm x 125mm. Five bags are palletized in each layer of either 8 or 11.

Finally, a stretch hood providing maximum stability during transportation and protection of bags from external agents (rain, dust, etc) unitizes the assembly.

## Sea Bulk Container Packaging

Bulk shipments are provided in polypropylene woven liners fitted in to standard 20ft box containers. The liner has multiple ports (spouts) for unloading & loading. It is secured in to the container with strap loops inserted in to metal bars. The net weight of the polyethylene varies from 16.5MT to 20.0MT depending on the bulk density of the grade.

The material is delivered on a standard container chassis for customers who have their own lifting/tilting equipment or specially built tilting frames for customers without the necessary equipment.





## Potential Hazards of Polyethylene

### *Streamers*

Streamers are filaments of resin generated by friction of resin pellets and inner wall of pneumatic conveying pipes. Streamer can pose a safety hazard as well create feed and product quality problems. Streamers can plug filters, feeders, silo outlets, and reduce resin flow.

### *Fines and Dust*

Small amount of fines and dust particles are always present in pelleted polyethylene resins. Re grind, dry colorants and additives in powder form can also bring in hazardous dust particles. Such dust particles dispersed in air can form explosive dust cloud. Many colorants and additives are finer than polyethylene dust particles and thus more prone to dust explosion. Fines and dust also present inhalation hazard if dispersed in the workplace. The amount of dust in the work environment is regulated by standards such as OSHA 1910.1000.

### *Static Electricity*

Movement of polyethylene pellets generates static charge on their surface. The total electrical energy stored in a mass of polyethylene in a bin or silo can be quite large. However, high resistivity of polyethylene resin prevents discharging of large surface areas by a single spark. However, an ungrounded metal piece of conveying equipment can present significant hazard as it can get charged from the polyethylene resin to a voltage high enough to jump an air gap to ground, discharging entire metal surface in a single spark.



# Control of Hazards

## *Resin Handling Systems*

Avoid excessive air velocity and loading rate and consider the following for your system:

- Use pipes with treated internal walls.
- Minimize number of bends.
- Minimize resin-conveying distance.

Ground and maintain proper grounding of all equipment by making sure:

- All conveying equipment, pipes and hoses are made of electrically conductive materials, such as, aluminum, stainless steel, conductive rubber or plastics.
- Properly bond together all conveying and storage components including bins, rotary valves, dust collectors and internal bag cages and conveying lines both rigid and flexible such that ungrounded sections do not act as capacitors and develop large static discharge.
- Ground all sea bulk containers while unloading material.

Prevent accumulation of fines and dust to prevent possible explosions:

- Design and operate storage vessels and conveying systems for minimizing hazardous concentration of fines.
- Select proper size of dust collectors for your system.
  - Keep air to cloth ratio of 5.7:1
  - Keep superficial upward air velocity between bags below 250ft/min (76m/min).
  - For pulse jet feature of dust collectors keep a 90psig (630kPa) pressure in the blowback manifold.
- Ensure good housekeeping in resin storage and processing areas. Fines accumulated on walls, ceiling supports or equipment top can easily become air borne and pose a potential explosion and health hazard.



## ***Resin Unloading and Haulage***

### ***Protective Clothing:***

Employees handling the resin must wear the protective clothing and equipment as and when necessary.

### ***Truck/Container Parking:***

Park truck/container in a safe designated area with a firm, flat and leveled ground for unloading.

### ***Loose Bags:***

To prevent loose bags in the top layers from falling, open one container door first and remove the bags. Open the other door only after removing all loose bags in the top layer.

Follow safe lifting techniques, such as the one below while picking up the bags:

- Make sure you have a tight grip on the bag.
- Pay special attention to your grip while handling bags of LLDPE grades (i.e.: EFDC-7050 and EFDC-7087), as they can slide out of hands.
- Bend your knees and not the waist.
- Let strong muscles in your legs do the lifting.
- Don not twist your body. Twisting can overload your spine and cause serious back injury.
- Hug the bag. Hold it as close your body as possible.
- Slowly straighten your legs.



### ***Palleted Bags:***

While unloading pallets be aware of the hazards and risks associated with forklift operations. Only trained and licensed personnel should operate the forklift following manufacturer instructions and site procedures.

Create exclusion zone around the truck/container. Check loads to make sure they are stable and within the capacity of the forklift. Do a trial lift to make sure the load is secure and safe on the forklift.



### ***Sea Bulk Container:***

The equipment used by you determines the unloading mode. Containers can be discharged by tipping them either by means of a tipping chassis on the delivery vehicle or a tipping platform, which may tilt the whole vehicle or the container alone. Properly ground the container. Connect discharge tube with the discharge spout. Connect flexible hose and tilt the container to 45°C. Transfer of resin pellets to silo is done by using gravity/air, a pump or pneumatic system. Unloading rates will depend on the size of your transfer system. Use the liners air bag facility when the pellets/resins are no longer free flowing out of discharge spout to remove easily the residual product remaining at the bulkhead corners, without the operator's manual intervention, thus eliminating any risk of material contamination.

Note: It is recommended to keep one door closed while offloading, especially when the container is fully loaded in order to reduce the pressure in the sea bulk liner which should be supported by the container wall, and avoid any liner failure.

Avoid spillage of resin as spilt pellets result in slippery floors. They can also seep in to the drainage and cause blocking. Use vacuum to remove the spilt pellets.



## ***Resin Storage***

Storage of resin should not create a hazard. Bags stored in tiers should be stacked, blocked, interlocked and limited in height so that they are stable and secure against sliding or collapse.

- Ensure your warehouse/storage area is under the protection of a deluge system. It is dust-free and dry with adequate ventilation and absence of sunlight. Keep storage temperatures preferably below 40°C.
- Pallets of LLDPE grades should be stacked in a single layer - no double stacking. Loose bags stacking should not exceed more than five (5) layers.
- HDPE resin Pallets should be stacked two high maximum. The upper layer pallets should overlap the middle of the two adjacent bottom pallets in an interlocking position ( Pyramid stacking ). Loose bags stacking should not exceed more than seven (7) layers.

### ***Further Precautions***

- Dust can collect on the stretch hood as well as bags during transportation and storage. Care must be exercised to avoid dust contamination of the resin. Wipe the bags clean with a lint-free cloth.
- Under large fluctuations in ambient temperature and high atmospheric humidity, moisture can condense inside the packed bag.
- Under these circumstances, dry the resin before use.
- Use a sharp razor to split open the bags to avoid fiber contamination.
- Empty bags in to a clean, enclosed feed bin or covered polyethylene lined bulk carton or drum.
- Remove empty bags from the processing area immediately.
- Inspect the feed apparatus for cleanliness and if necessary wipe with a clean lint-free cloth before inserting the feed tube in to the resin.





### ***Housekeeping***

- Do not allow waste to accumulate. Adopt a regular and frequent waste removal and cleaning procedure. Keep storage areas clean and free from all refuse and incorrectly stored materials.
- Never block fire exits.

### ***Waste Disposal Considerations***

- Reclaim the material where possible.
- Polyethylene is not a hazardous waste. Dispose of in accordance with appropriate government and local regulations.





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## CONTACT US

**EQUATE** strives to offer the best possible products and services available. Our experts are available to offer answers when you need them, as well as to expand on any of the techniques discussed here. We are also willing to visit your operation and work with you to optimize your operation.

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