

## Handling and Storage of Equistar Polymers

**EQUISTAR**

A Lyondell Company

**Equistar is one of the largest producers of ethylene, propylene and polyethylene in the world today. One of the largest, yet we pay attention to even the smallest needs of our customers.**

**We're a leading producer of polypropylene, oxygenated chemicals, performance products and wire and cable resins. We're an industry leader with an unwavering commitment to being the premier petrochemicals and polymers company in the world.**

**Our commitment starts with each of our more than 5,000 employees. It stretches out from our headquarters in Houston across 16 manufacturing facilities along the U.S. Gulf Coast and in the Midwest. It continues through our 1,400-mile ethylene/propylene distribution system that spans the Texas Gulf Coast.**

**We are the product of many minds coming together with the single focus of providing the right product for every customer. That's what drives us to maintain an extended product line, enhanced operating efficiencies, greater geographic diversity and strong research and development capabilities. That's what drives us to provide the resources that help us lead today and rise to the challenges of a changing industry tomorrow.**

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## INTRODUCTION

The movement of polymer pellets is a necessary part of our production, shipment and the customers' handling of these products before processing. At our customers' facilities a smooth transfer of resin from delivery vehicle to silo starts with the design of the transfer system itself and ends with proper procedures for daily operations. To assist customers with the safe and proper handling and storage of our polyolefin products, this manual provides recommendations for:

- Piping design
- Transfer system air
- The silo
- Safety points
- Unloading hopper cars, hopper trucks and handling Gaylord boxes and 50-pound bags
- Special handling required for performance products
- A troubleshooting guide

Following these suggested policies and procedures can minimize the contamination associated with pellet movement that might cause difficulties in production.

When pellets are transferred at high velocities through a piping system, the heat generated from the friction between the pellets and the pipe surface causes the pellets to warm to their softening point. At this temperature, part of the pellet softens and smears on the interior walls of the piping where it almost instantly solidifies again, forming a skin along the pipe surface. Further transfers of polymer cause this skin to peel off, resulting in strands of polymer of varying lengths mixed with the pellets. These strands, commonly referred to as "streamers," "angel hair" or "snakeskin," can plug the filters of the conveying system. As different grades of material pass through the system, the streamers may have different physical properties. These streamers, if they make their way to the processing operation, can contaminate the feed material and stop production.

"Fines" are created from the abrasion that occurs as the pellets come in contact with the surfaces of the piping system. When the pellets bounce against the surface of the pipe, very small pieces can break off the surface of the pellets. These tiny pieces of polymer act like dust and can plug the filters in a vacuum-driven piping system. In sufficient quantity, fines can also interrupt production.

## HANDLING AND STORAGE OF EQUISTAR POLYMERS

In this manual, we interchangeably refer to Equistar polyolefin products (polyethylene, polypropylene, and ethylene vinyl acetate copolymers) as polyolefins, pellets (because that is their shape) and resin. Equistar performance products addressed in this manual include resins and compounds for wire and cable extrusion; polyolefin powders for rotational molding and compounding, bulk and sheet molding compounds and specialty applications; and ethylene vinyl acetate copolymers for adhesives, sealants and coatings.

Equistar polymer products are shipped directly to customers in rail hopper cars and/or hopper trucks from production facilities or shipped to regional distribution centers, where the products are then loaded onto trucks or into boxes and bags. All the distribution and handling of our products before shipment are through enclosed systems. This process minimizes the possibility that the product loaded has any contamination, such as dust, leaves, water, trash, dirt, gravel and other material that can enter a system if it is exposed to air and inclement weather (**Figure 1**).

When those hopper cars, hopper trucks, loads of boxes or bags of polyolefin resin arrive at your plant, you are dealing with a large, expensive “package” full of small, polyolefin pellets or powder that must be moved from one place to another as quickly as possible. When the transfer goes as it should, the resin gets to its silo or storage area without hang-ups, blocking, bridging or plugging. The empty hopper car gets returned to the railroad agent undamaged or the hopper truck goes on to its destination. Any spilled pellets get collected in catch pans and disposed of and production of your product continues unabated.



**Figure 1.** Loading a polyolefin product into a hopper car.

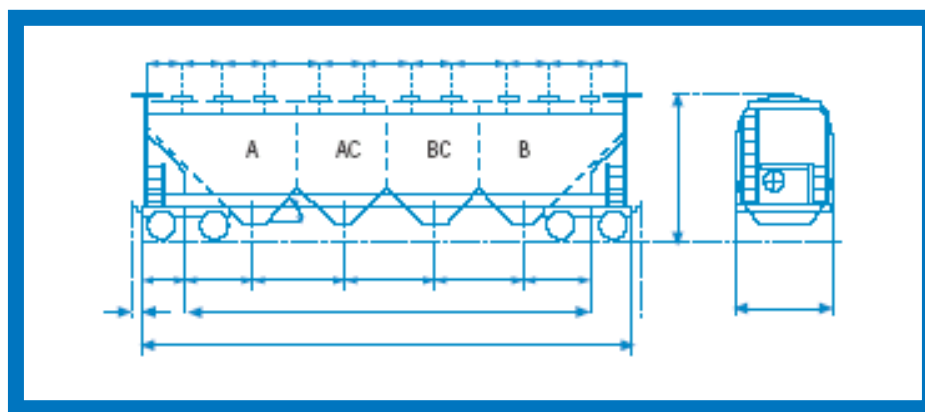
### Operation Clean Sweep

Equistar supports and encourages its customers to support Operation Clean Sweep, a program aimed at preventing the release of plastic pellets from manufacturing facilities into the environment. More information on Operation Clean Sweep can be found at [www.opcleansweep.org](http://www.opcleansweep.org).

**The U.S. EPA’s Storm Water Regulations classify resin pellets as “significant materials,” making the exposure of even a single pellet in storm water run-off without a permit subject to regulatory action.** Birds, fish and other wildlife can be injured or killed as a result of ingesting plastic pellets. **On pages 25-27 of this manual is a list of specific steps to prevent resin release into the environment.**

## HOW EQUISTAR PRODUCTS GET TO CUSTOMERS

By far, the largest volume of Equistar products are shipped to customers by rail in hopper cars, which typically carry 185,000 pounds of polyethylene. Hopper cars are usually divided into four compartments (**Figure 2**). In a standard, four-compartment car, the compartments are labeled “B” for brake-end compartment, “A” for the opposite end compartment, and “BC” and “AC” respectively for the two center compartments.



**Figure 2.** A typical hopper car is divided into four compartments.

A hopper truck transports 45,000 pounds of polymer on average. Equistar also ships products in 1,000- and 1,500-pound Gaylord boxes and 50-pound polyethylene or woven polypropylene bags. A trailer load of these packages totals 42,000 pounds of product plus the pallet and carton weights. To store 50-pound bags, we recommend stacking them as shown in **Figure 3**.

## TRANSFER AND STORAGE SYSTEMS

To handle bulk shipments of polyolefins, Equistar recommends the following design suggestions for the layout of new or modified transfer systems.

**Figure 4** is a typical polyolefin resin handling and storage system for high volumes of material arriving via railcar or hopper truck.

Most hopper car transfer systems work by creating a vacuum that pulls the resin out of the hopper car and into the silo or in-plant transfer system. This vacuum/suction system has the simplest material-feed arrangement among the types of transfer systems available, so hopper cars, trucks, bins and boxes can all be unloaded without the need for complicated equipment at the feed end. Secondly, this system provides the best dust and fines control.



**Figure 3.** Fifty-pound bags of polyethylene stacked on a pallet and wrapped.

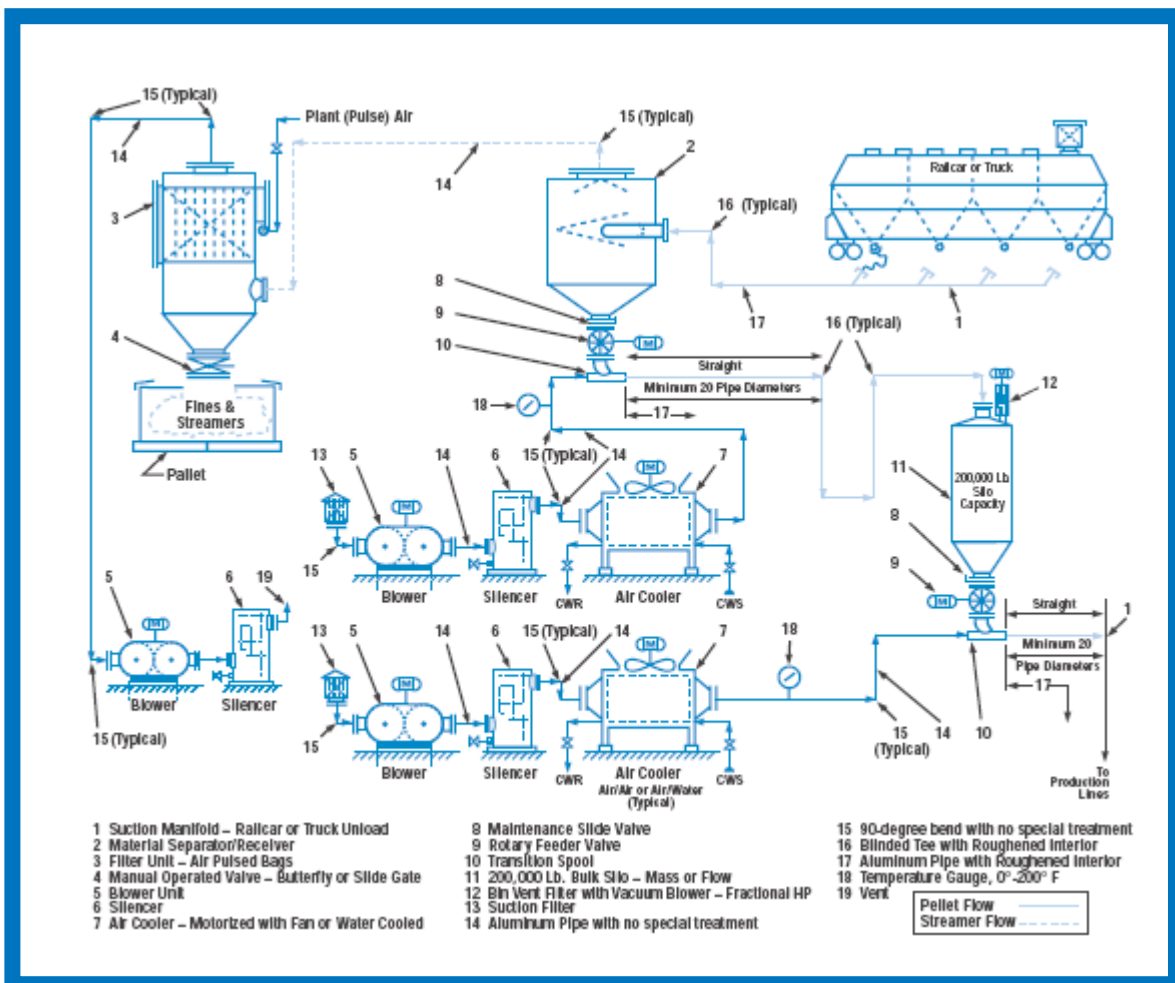
This system's major disadvantage is its limited conveying range. The greater the distance the pellets must travel, the greater the vacuum pulled must be. With higher vacuums, the air-to-solids ratio is increased and leads to slower unloading.

Hopper trucks use a built-in system of blowers that push the resin out and into the in-plant transfer system. Optimum hopper truck pick-up air velocity is 4,500 feet per minute (fpm).

The most common in-plant transfer system is a dilute-phase system. Dilute-phase systems are sometimes called "stream-flow conveying." A high-enough air velocity and a low-enough conveyed solids-to-air ratio characterize this system so the solids pass through the line suspended in a relatively uniform stream.

If the piping (also called "lines") in the in-plant transfer system is not designed properly, problems can result, including inefficient resin transfer, generation of fines and streamers, contamination, excess power usage and increased downtime as lines must be disassembled more often for thorough cleaning. The following sections of this manual review several parts of the transfer system.

**Figure 4.** Recommended resin pellet handling/storing system for unloading a railcar or truck.



## PIPING DESIGN

### Layout and Length

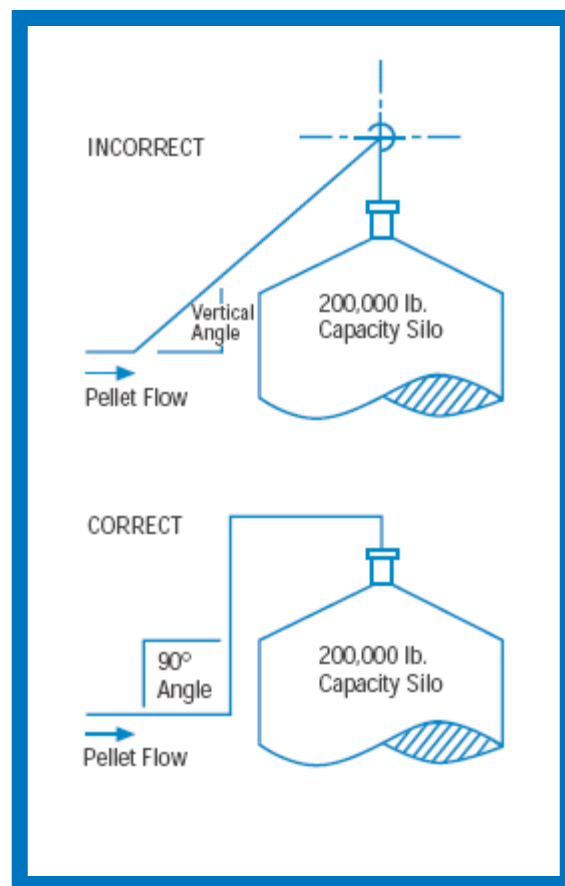
The layout and length of the transfer piping or lines determine to a large extent how easy and trouble-free it is to move the resin from the car or truck to the silo. Transfer piping should run as short a distance as possible between the unloading area and the storage silo. Shorter distances mean fewer opportunities for contamination to enter the system or for fines and streamers to form within the system. Parking and unloading areas for hopper trucks should optimally be around 20 feet from the silo; 40 feet is the maximum distance for efficient unloading. However, since hopper cars go only where the rails take them, transfer piping between rail sidings and silos can be considerably longer.

In designing a transfer system, the engineer must strike a balance between minimizing the distance from the unloading sites to the storage silos and minimizing the distance from storage silos to work areas. Transfer piping between the silo and the processing machines should optimally run no more than 200 feet to 300 feet. Keeping to that measure may mean much longer lengths of transfer piping on the front end from the unloading area to the storage silo.

One mistake often made in the design of a transfer system is not allowing enough time for the pellets to reach velocities that prevent saltation. At the saltation point, the air velocity is no longer high enough to keep the pellets moving. The pellets fall out of the air stream and move along the bottom of the piping. This movement increases power requirements and can lead to plugging of the system. To provide the time needed for the pellets to enter the conveying air stream at the bottom of the silo and reach conveying velocities, a straight section of piping, equal in length to 20 times the diameter of the pipe used, is necessary before reaching a vertical bend or “elbow.”

Transfer piping should run horizontally and vertically, not diagonally. In other words, all elbows — and the number of elbows should be kept to a minimum — should have angles of 90 degrees. Tipping the piping should be avoided. If the pipes must be tipped, then their slant should be no more than 10 degrees from the vertical or horizontal plane. Sloped or tipped lines allow the pellets to slide back and can lead to plugging of the line (**Figure 5**).

**Figure 5.** Piping sections running horizontally and vertically with elbow, showing correct and incorrect angles.

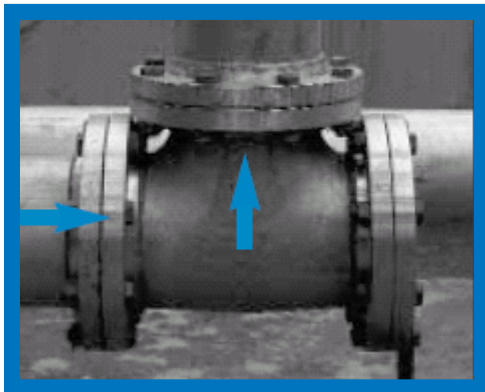


Long radius elbows are not recommended for pellet conveying when streamers are a concern. “Blinded tees,” or other specialty elbows designed to minimize creation of fines and streamers, should be used (**see Figures 6-9**). Contact your Equistar technical service representative for further details.

If possible, long horizontal distances should be avoided.

- It is easier to push pellets vertically than horizontally.
- Because of their bulk density, pellets are more likely to fall out of the air stream as they move horizontally.
- Less blowing air is needed to move the resin vertically.
- The horizontal movement of the pellets along the pipe walls builds up heat in the pipes, which can lead to the formation of fines and streamers.

In short, in laying out transfer system piping, minimize the number of changes in direction the flow of pellets must take from their unloading point to the storage silo. Minimizing the number of bends, twists and turns in the transfer piping minimizes the occurrence of pressure drops as the pellet stream moves through the piping.



**Figure 6.** A blinded tee

Fewer pressure drops mean fewer chances for pellets — softened by their exposure to friction and warm blowing air — to drop out of the stream, slide along the walls of the elbows and create streamers. More on these types of contamination follows in the next section of this manual.

### Pipe Interior

Decreasing the time the pellet slides along the pipe’s interior surface reduces the sliding friction that can cause streamer formation. The most common way to minimize this time is to roughen the inside surface of the conveying line. When pellets contact a rough surface, they roll or tumble instead of slide.

When the pellets bounce against the rough surface, they do leave a very small amount of residue called fines. After bouncing against the rough surface, the pellets continue in the direction of the airflow. Conveying pipes can also be purchased with specially manufactured, rough, interior surfaces. Equistar plants use various types



**Figure 7.** Blinded tees

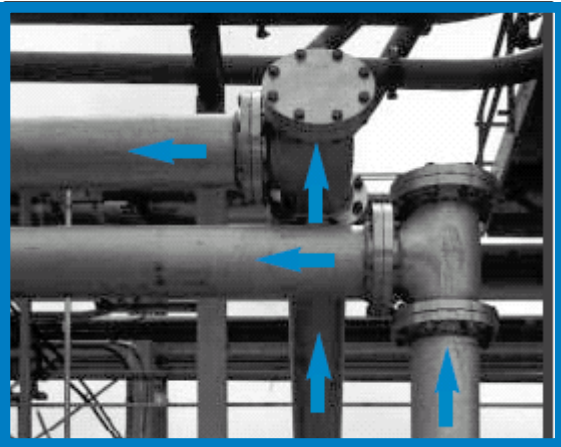


Figure 8. Blinded tees



Figure 9. Blinded tees

of piping to prolong piping life and minimize streamers. Contact your Equistar technical service representative for more information.

Recently, there has been an increase in the use of blinded tees and short-radius elbows where a change of pellet direction is required. When pellets come to the blinded end of a tee, they hit a layer of pellets in the end of the tee and then proceed in a new direction. At the end of the transfer process, the blinded end empties itself. There has been no documentation of cross-contamination due to resin remaining in the pocket of the blinded tee between transfers.

Piping system inspection and maintenance should be performed periodically to assess the condition of the roughened inner surfaces. Wear on these sections can be easily seen. Roughened surfaces can be restored in elbows. Straight sections showing wear can often be rotated at least once before additional roughening becomes necessary. Interior pipe walls can be roughened by sandblasting or shot peening.

Equistar does not recommend roughening be done while the pipe is in place or “on line.” as it is very difficult to completely purge the system of contaminants afterwards.

See **Appendix 1: Pellet Conveying Troubleshooting Guide** for suggested courses of action on some of the most common pellet conveying problems.

## TRANSFER SYSTEM AIR

The most important rules for successful resin transfer are to keep transfer air temperatures low and velocity in-range. Air pressures should be minimized and the distance the pellets must travel between the hopper car or truck and the silo kept as short as possible.

Following these guidelines concerning operational design and transfer systems can result in the reduction or elimination of fines and streamers. If the transfer system and the layout of the conveying lines are well designed in the first place, a number of efficiencies and savings beyond the initial installation can also be achieved.

Blowing air is also used to purge transfer lines and silos to clean them and prevent current shipments of resin from being contaminated by the remains of previous ones. Purging the lines in this manner is highly recommended when different products are conveyed by the same system.

## A Pressurized-Air, Dilute-Phase System

The air transfer system that moves pellets from the hopper car must be constantly monitored. Some form of cooling system using water or air is necessary. The temperature of the transfer air should not exceed 100°F when conveying PE homopolymers and all PP products. Higher temperatures can add to the effect of friction and soften the pellets, leading to streamer formation, as described previously.

If the pellets are ethylene copolymers, the air temperature must be maintained at even lower temperatures. Blowers on ethylene copolymer transfer lines should be cooled with chilled water to an air temperature of about 90°F. **See Table 1** for the softening point – not the melting point – of the resin that you are purchasing. The transfer-air temperature must be kept well below that level.

**Table 1**

Product Trade Name	Polymer Type	Approximate Softening Temperature <sup>1</sup> (°F)
Alathon <sup>®</sup> , Petrothene <sup>®</sup> , Microthene <sup>®</sup>	HDPE	255
Microthene, Petrothene, Petrothene Select	LLDPE	185
Petrothene, Microthene, Ultrathene <sup>®</sup>	LDPE & EVA Copolymers	145
Petrothene	PP (all types)	220

<sup>1</sup> Softening point temperature has a range of  $\pm 15$  °F

Transfer air should be filtered to prevent contamination of the resin by debris. Hopper trucks are equipped with filters on the inlet and outlet sides of their blowers, but filters must be attached to hopper car hatches (on non-vented cars) and outlet tubes. If filters are clogged or dirty, the temperature of the transfer air rises. **REGULAR MAINTENANCE IS ESSENTIAL.**

Typically, about 2.5 cubic-feet-per-minute of air are used for each pound of material being conveyed. The minimum pick-up velocity for a pressure system is 4,200 fpm. A higher pick-up velocity increases the friction of the pellets on the pipe, increasing the chance of streamer formation. A lower pick-up velocity may go below the “saltation point,” the velocity at which pellets begin to settle out of the air stream to the bottom of the piping. Optimum pick-up velocity is approximately 4,500 fpm.

Air temperatures must be kept as low as possible. For every pound the air pressure increases across a blower and filter, the air temperature increases about 15°F. The ideal air temperature of 90°F after the blower should be maintained with an air cooler.

The pressurized air system is designed so the air stream is separated from the pellets by a filter. The pellets are released from the air stream, but fines and streamers, if present, accumulate on the filter. After transfer the filter is pulsed with a blast of high-pressure air to dislodge the fines and streamers, which are then collected for disposal. Without regular maintenance, the weight of the accumulated fines and streamers can cause the built-up material to drop into the flow of pellets and clog the transfer system.

## A Vacuum, Dilute-Phase System

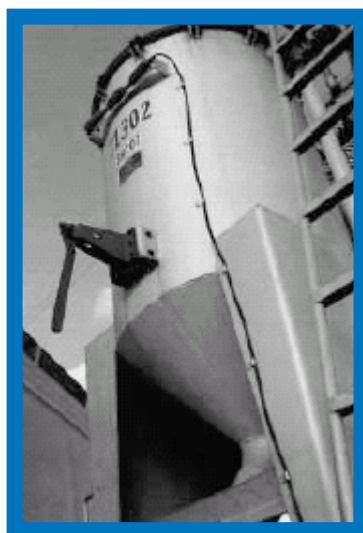
Particularly for temperature-sensitive resins, such as ethylene copolymers and crosslinkable wire and cable compounds, vacuum conveying works better than pressurized air systems. Although more expensive to install and operate, conveying temperatures in a vacuum system are lower, which prevents problems discussed earlier. The most common transfer systems for hopper-car unloading utilize vacuum conveying.

For vacuum conveying in a dilute-phase system, the pellets go into a disengagement hopper which separates the air from the material being transferred, thus avoiding the accumulation of fines and streamers that can plug the transfer system.

## THE SILO

### Funnel or Mass Flow Design

For a silo to accommodate a hopper carload of polyolefin resin, it must be able to hold 200,000 pounds. Ideally, silos are made from stainless steel, but aluminum and carbon steel silos with epoxy linings are common. This lining must be checked periodically for wear. If the lining is worn and thin in areas, contamination of the resin can result where the pellets contact the carbon steel (**Figure 10**).



**Figure 10.** Silo with a 60-degree cone-shaped bottom for ease of product flow and maintenance.

Silos are usually designed to store products within a range of bulk densities. If you do not know whether your silo was designed to handle polyolefins, contact the manufacturer. Silos can collapse if the bulk density of the stored material is too high for the silo to handle. **CAUTION:** Do not overload your silo. For the typical bulk density of Equistar polymers, see **Table 2**.

**Table 2**

PLANT	EVA	HDPE	LDPE	LLDPE	PP
Bayport, TX			33 – 36		
Chocolate Bayou, TX		33 – 35			
Clinton, IA	33 – 37	33 – 37	33 – 34		
La Porte, TX			34 – 36	31 – 32	
Matagorda, TX		33 – 37			
Morris, IL			33 – 36	32 – 36	32 – 33
Victoria, TX		37 – 39			

Silos with diameters of 10 feet are common, but silos with 12- and 14-foot diameters are now available. The standard cone-shaped bottom of the silo has an angle of at least 60 degrees for the polymer to flow easily; silos with larger diameters must be supported at a greater height above the ground than silos with smaller diameters. However, larger diameter silos are shorter in height overall than ones with smaller diameters, an advantage in terms of handling product. Cone bottoms with slopes of 60 degrees or more are recommended. These bottoms are easier to clean and maintain and are necessary if the silo is used to store polyolefin powders.

At the bottom of the silo cone is a rotary airlock, a device that prevents air loss when the resin is transferred or removed from storage and controls the feed rate to the conveying system. The controls on this device should be connected to the blower so the blower can be operated with or without the rotary airlock operating. However, the opposite situation should be prevented: the airlock should never be able to operate unless the blower is running.

Another device, a powered bin-vent filter, is located at the top of the silo. This device prevents backpressure in the silo and stops fugitive fines and streamers from being released into the atmosphere. This filter should be periodically checked and cleaned.

The silos themselves should be cleaned at least annually, more often if soft products are stored, and whenever the product stored is changed. Silo cleaning should include a thorough washing followed by air drying before filling with resin.

### **Measuring the Resin in the Silo**

The most common measurement techniques utilize weigh cells on the silos themselves. While these systems provide a direct readout of the weight of material in the bin, they can be expensive and difficult to maintain. The cost to retrofit weigh cells to an existing silo may be prohibitive.

The level of material in the silo can also be determined by using a strapping tape, essentially a measuring tape with a weight on the end. A pyramid-shaped weight placed on the tape with the flat end down is often used because this shape can rest on the surface of the pellets. Tables are used to convert the free space in the bin to volume and then to weight.

The manual strapping operation is simple, effective and inexpensive, but not as accurate as weigh cells in good working order. Proper procedures to prevent contamination and avoid safety hazards must be in place and enforced for all measurement operations. Catch bars should be installed on all silo openings or hatches to prevent falls. Proper use of safety harnesses may also be necessary.

## HANDLING A DELIVERY OF PELLETS OR POWDER

### RECOMMENDED SAFETY POINTS BEFORE OPENING HATCHES

- “Blue flag” the track.
- Understand the equipment you are about to operate. If you have any questions, do not proceed without contacting your supervisor or an experienced co-worker. Check for any safety risks before you begin.
- Put on safety goggles, hard hat, safety shoes, protective gloves and hearing protection if you will be working near the transfer units.
- Secure the hopper car. Set the hand brake, derails, chocks, “Car Connected” signs, etc., so the car cannot be moved during the unloading process.
- Place catch trays or tarps around the delivery area to contain spills and meet the requirements of Operation Clean Sweep (see page 4). An alternative is to pave all unloading areas for easy cleanup.
- Inspect the hopper car to make sure no seals are broken and there is no damage to the car. The packing list for the car provides a list of seal numbers and the volume of resin of the car. Any problems with seals or car damage should be reported immediately to your Equistar customer service representative. Do not unload the car until the delivering railroad agent has been notified and you and the agent make a joint inspection.
- Make sure ventilation is adequate. Some resins have residual odors, which may be objectionable.
- If you have to climb on top of the railcar, you must protect yourself from falling off the car. If the car is not located in a building with a safety handrail system, make sure you are wearing a safety harness attached to a cabling-fall-protection system or a stationary rail to catch you if you fall.
- Attach a ground wire to the car and ground all metal handling systems. Non-metal containers can be grounded by placing a grounding rod in the resin.
- Make sure the unloading system is set up so the unloaded resin is sent to the proper location.

### STATIC ELECTRICITY

The need for grounding is based on the fact pellets accumulate static charges during transfer and handling, which normally are little more than a nuisance. The lining of the car prevents the charges from dissipating. However, people sampling the hopper car through the hatch should be aware static charges are present. While the shock does not kill, sudden movements after a shock could lead to injuries; if, for example, the person is on top of the car and does not have a harness properly attached to a stationary bar.

One way to prevent shocks during sampling is to momentarily rest the handle of the sampler on the hatch and then push the sampler into the pellets.

## PREPARING THE HOPPER CAR FOR UNLOADING

After safe access to the top of the car has been established . . .

- Cut seals and open the hatch on the compartment to be unloaded.  
**Opening the hatches is not necessary on vented cars.**
- Visually inspect the product in each compartment. Report any contamination, such as water, different-looking resins, dirt, leaves, insects, etc.
- Inspect the hatch opening and install a filter over each opening to prevent contamination from dirt, water, etc.
- Remove both caps on the unloading tube and the plastic valve inserts. Inspect and clean the tube and place a filter on the end that is not in use (**Figure 11**).
- If there is no obvious contamination, take samples.
- Make sure you are wearing clean, rubber gloves when taking samples and that the containers for the samples are clean.
- Wipe the valve outlet with a clean cloth.
- Take the sample and replace the shield and valve caps if the car is not to be unloaded immediately.
- Recheck the hook-up to make sure the product will be transferred to the correct storage silo.
- If the compartment will not be completely unloaded that day, close all outlets and hatches to prevent contamination and vandalism.
- Reseal the compartments.

Courtesy of Dyna-Bulk, Inc.



**Figure 11.** Hopper car delivery: inspecting the unloading tube and placing a filter and catch pan.

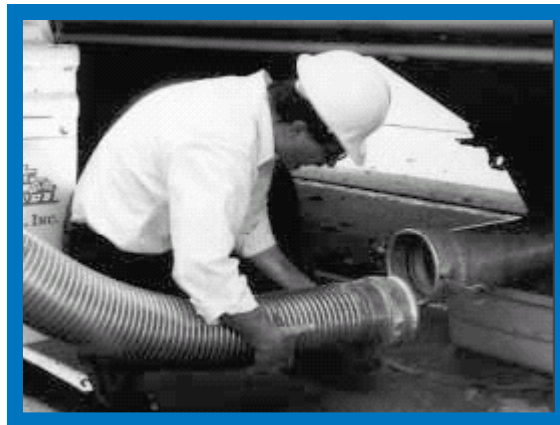
## UNLOADING THE HOPPER CAR

### Hoses

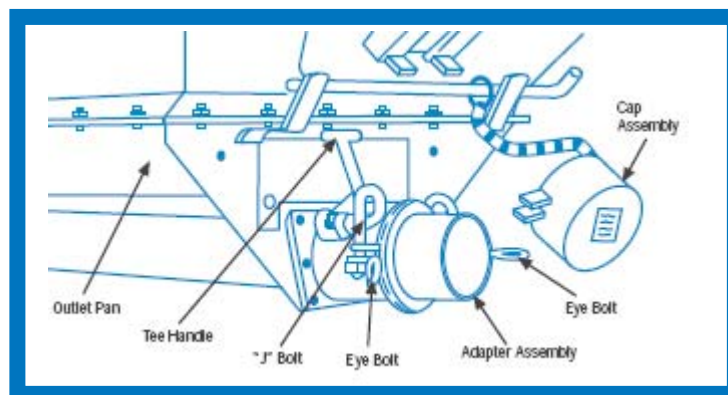
- Stainless steel hoses are preferred. Clear plastic hoses are commonly used, but must be checked often for abrasions, breaks and distortion.
- Make sure the hoses are clean. Between deliveries, hose ends should be covered to prevent contamination. Pellets and fines can catch at hose end fittings and can cause contamination of future deliveries, unless hoses are cleaned before and after unloading.

- Make sure metal hoses are set up so the product is flowing in the direction of the coils or spirals. If the product flows in the “wrong” direction, the resin could abrade and fines could result. Most hoses are marked to indicate the direction for correct set-up. Equistar recommends that operators do not stand on the hoses. This action can shorten hose life and is also a safety hazard.
- Hook transfer hoses onto the outlet valve of the hopper car (**Figure 12**) or hopper truck (**Figure 13**). Make sure the hoses are not lying in water or on dirt, as contamination could be pulled into the system from these sources.
- All sources of air drawn into hoses and conveying system must be filtered to prevent dirt, dust and other contamination from entering the system.
- Hoses must be grounded.
- Minimize the number of bends in the flexible hose as bends add to the pressure drop in the conveying system and can lead to plugging of the lines.

Courtesy of Dyna-Bulk, Inc.



**Figure 12.** Hopper car delivery: hooking up the hoses.



**Figure 13.** Basic components of an adjustable pneumatic outlet.

## Venting

- Make sure roof hatches and tubes at the bottom are opened and covered with filters. If present, remove the plastic film underneath the hatch cover as well as the plastic valve inserts in the unloading tubes. If these “vents” are not opened and unloading occurs, the roof of the hopper car could collapse, resulting in expensive repairs. Properly handling bulk deliveries lessens these costs.

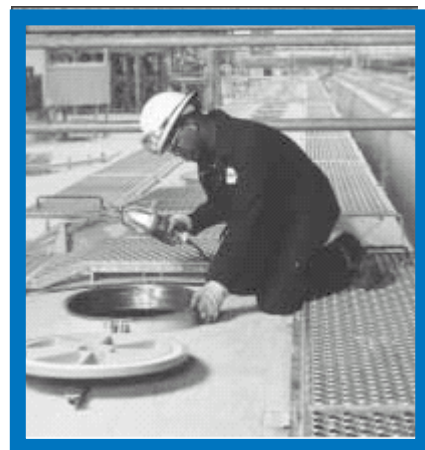
Vented hatch covers can be found on some hopper cars. These cars have air inlets on the hatch covers that allow the car to “breathe.” The construction of the car is protected and load condensation is reduced as a result. Stenciling on the car identifies cars with vented hatch covers. Hatch covers on vented cars do not need to be opened before unloading.

## Plant Transfer System

- When prevention of contamination from a previously conveyed material is necessary, wash out and dry by blowing air on parts of the transfer system, particularly the cyclone, airlocks, chutes, etc., to remove dust and pellets from previous deliveries. Make sure these areas are dry before unloading.

## After Unloading Each Compartment

- As each compartment empties, the flow rate goes down because air is being drawn into the control valve and the vacuum is decreasing. At this point, rotate the valve to remove product from the side of the compartment closest to the valve. The flow rate should go back up to the set level. When the flow rate goes down again, move the valve back and forth in the compartment to remove all of the resin.
- Shut off the transfer system.
- Disconnect the hose from the outlet for the unloaded compartment. **(NEVER disconnect the hose until you have shut off the blower.)**
- Close the control valve.
- After establishing safe access to the top of the hopper car, make sure the compartments are empty by removing the hatch filter and **LOOKING THROUGH THE TOP HATCHES WHILE SHINING A FLASHLIGHT OR WORKLIGHT INTO THE CAR (Figure 14.**



**Figure 14.** Hopper car delivery: making sure the compartments are empty.

- DO NOT use probes to remove bridged material from the car walls or bang on the car walls with heavy objects. These actions can damage hopper cars and their linings, requiring expensive repairs. If bridging occurs, contact your Equistar customer service representative for technical advice.
- Disconnect the transfer system from the hopper car's discharge outlet.
- Remove filters.
- Make sure the valve is closed and all discharge outlets are capped and secured.
- Remove catch trays or tarps and properly dispose of any spilled material.
- Put filters on the openings of the next compartment to be unloaded.
- Attach the hose to the next compartment's outlet and start the blower.
- Check the transfer pressure and get up to the desired transfer rate.
- Repeat this procedure with each compartment in the hopper car.
- Make sure both sides of the hopper car compartment have been emptied, both the "near side" and the "far side."

#### **After the Car is Completely Unloaded**

- Close hatches and bottom tubes and reinstall the caps on the tubes and valves.
- Prepare "Empty Return" bill of lading.
- Notify railroad agent to pull the railcar as soon as possible.























