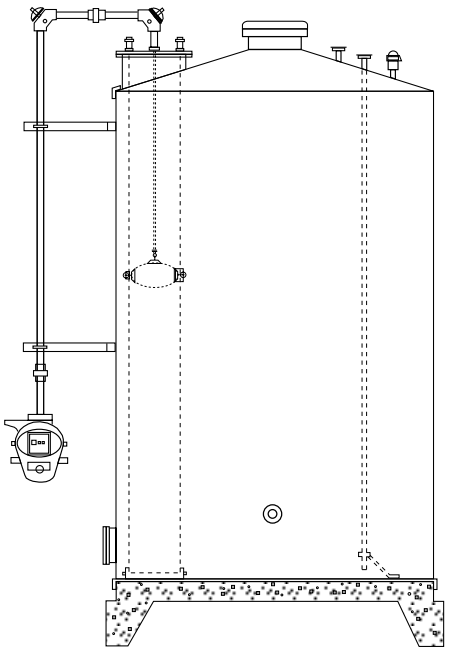
Bulk Storage and Handling of Isobutyronitrile and n-Butyronitrile



EASTMAN

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Introduction

This publication provides information on the methods Eastman uses in storing and handling isobutyronitrile (IBN) and n-butyronitrile (NBN), and on storage tank construction and facilities Eastman uses for tank car and tank truck handling of IBN and NBN. The information is presented solely as a guide in developing guidelines and facilities for handling *Eastman* nitriles.

Each customer/user must be aware that the brochure has been written for the United States market. Customers/users in other areas should understand the local laws and regulations of the particular country involved. Customers must determine for themselves the appropriate guidelines and facilities for their operations. To assist in that determination, the information in this publication should be reviewed in conjunction with the information contained in Eastman's Material Safety Data Sheets (MSDS).

Federal, state, and local regulations, or the laws and regulations in the country in which you are situated, regarding the handling and storage of chemicals may vary widely. For example, in the United States, the federal Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), National Fire Protection Association (NFPA), and a user's insurance company also impose safety standards. In addition, the United States Department of Transportation (DOT) prescribes rules and regulations for unloading hazardous materials from tank cars and tank trucks (see 49 CFR 100–199). Knowledge of these and other applicable federal and state laws and regulations, as well as consultation with the proper authority, should provide guidance for developing adequate handling guidelines and constructing appropriate storage and drumming facilities.

Storage Equipment

Tank construction materials and facilities for tank car and tank truck handling of these materials are described and illustrated on the following pages. The drawings and discussions are given as information only and should be used solely as a guide in the storage and handling of these Eastman products. Customers must determine for themselves the appropriate storage and handling facilities for their operations in the country involved.

For the location, fabrication, installation, inspection, and testing of nitrile storage tanks, the designer should refer to appropriate standards including the following:

ANSI/NB-23—National Board Inspection Code
ASME Boiler Pressure Code, Section VIII, Division 1
API Standard 510—American Petroleum Institute Inspection Codes
API Standard 570—Inspection, Repair, Alteration, and Rerating of In-Service Piping
API Standard 620—Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks
API Standard 650—Welded Steel Tanks for Oil Storage
API Standard 653—Tank Inspection, Repair, Alteration, and Reconstruction
API Standard 2000—Venting Atmospheric and Low-Pressure Storage Tanks
29 CFR 1910.106—Flammable and Combustible Liquids
NFPA 30—Flammable and Combustible Liquids Code

Bonding and grounding are important to inhibit the accumulation of static electricity and provide safe discharge. Bonding and grounding are required for all equipment, piping, tank cars, tank trailers, and interconnections. Designers should refer to the appropriate standards including the following:

API RP 2003—Protection Against Ignitions Arising Out of Static, Lightning and Stray Currents
NFPA 77—Recommended Practice on Static Electricity

For maintenance of storage tanks and relief devices, it is recommended that the customer establish a regular schedule for inspection of tanks, relief devices, and piping.

Tank Construction Materials

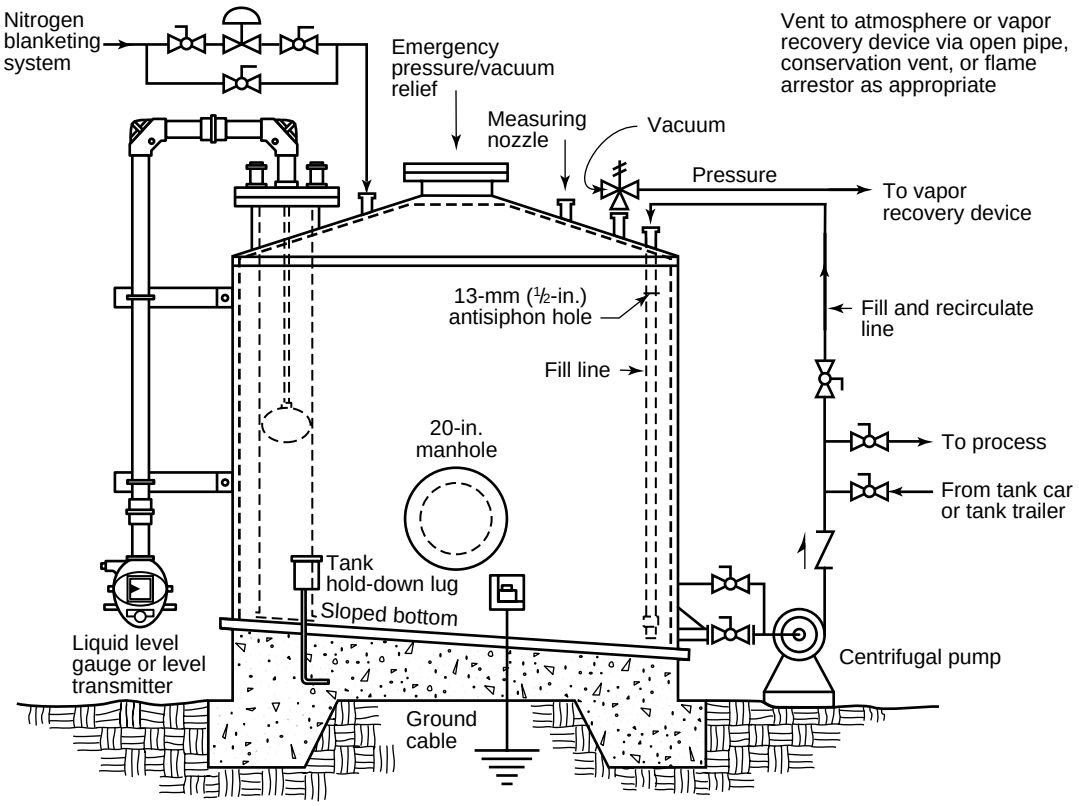
Storage tanks should be constructed of carbon steel. To reduce corrosion of the tank bottom exterior, a coating should be applied between the tank and its foundation.

A vertical atmospheric storage tank is shown in Figure 1. The storage tank area should be enclosed by containment facilities capable of containing the contents of the tank and the maximum expected rainfall for an appropriate design storm event. The enclosed area should be drained through a trap to a safe location that is protective of human health and the environment and in compliance with applicable laws and regulations. A vertical tank provides a more economical use of land than does a horizontal tank.

Normal handling temperatures are above the flash points of isobutyronitrile and n-butyronitrile. To inhibit the accumulation of static charges, the storage tank, pumps, transfer lines, and the offloading vehicle should be adequately grounded.

Figure 1

Storage Tank



Note: A leak detection system with provisions for secondary containment is recommended.

Piping

Flanged and welded steel should be used for the transfer lines.

Transfer lines should be welded and have no screwed fittings. Pipe connections should be flanged with 150-lb forged steel lap jointed flanges. Gaskets made of *Teflon* plastic[1] (or equivalent PTFE[2]) 1.59 mm (1/16 in.) in thickness are recommended, but spiral-wound gaskets with flexible graphite filler can also be used for the flanged fitting.

Pumps

Centrifugal pumps should be considered for IBN and NBN transfer. A self-priming centrifugal or positive-displacement pump should be used when unloading tank cars from the top. Centrifugal pumps should have mechanical seals. For Eastman installations, all parts of the pumps wetted by the liquid are made of Type 316 stainless steel.

Valves

Flanged ball or sleeve type plug valves with seats, sleeves, seals, gaskets, and packing made of *Teflon* plastic (or equivalent PTFE) should be considered for use in IBN and NBN transfer lines.

Vents

If environmental laws and regulations of federal, state, and local agencies permit, tank vents may be open to the atmosphere. The vents should be angled at 45° from vertical and cut off vertically to prevent rain from entering. The vents should be at least 1 inch larger in diameter than the tank fill line and in accordance with the appropriate sections of 29 CFR 1910.106, API Standard 2000, and NFPA 30. A coarse-mesh stainless steel wire screen should be placed over vent openings to prevent entry of foreign objects. Per 29 CFR 1910.106, if the storage tank is located inside a building, the vents should extend outside the building. It is recommended that solvent storage tanks be protected with a blanket of nitrogen and equipped with a pressure/vacuum conservation vent piped away to a safe location that is protective of human health and the environment and in compliance with applicable laws and regulations.

Tank Fill Line

The fill line should enter the tank through the roof and extend downward to within 2–3 inches of the bottom of the tank to inhibit the accumulation of static charges. The tank should also be blanketed with nitrogen.

[1] *DuPont*
[2] *Polytetrafluoroethylene*

The following pages outline suggested guidelines for unloading tank cars and tank trailers. These guidelines are for information only. In addition, consult and observe the comprehensive DOT or other applicable regulations. It is the customer's responsibility to be aware of and comply with all applicable laws and regulations governing the unloading of tank cars and tank trucks.

Eastman nitriles are shipped in aluminum, steel, or stainless steel tank cars and/or stainless steel or aluminum tank trailers. The usual tank car sizes are 10,000 and 20,000 gallons. Tank trailer sizes vary upward from 4,000 gallons. The unloading area should be provided with an emergency containment and drainage system to direct, at minimum, the contents of the offloading vehicle in the event of a spill to a safe location that is protective of human health and the environment and in compliance with applicable laws and regulations.

Also, a vapor return line can be used to comply with EPA or other applicable venting requirements.

Tank Car Unloading

Unloading operations should be performed only by reliable persons properly instructed in unloading hazardous materials, for example, per United States regulations 49 CFR 174.67 or applicable regulations in your country. The recommended method of unloading tank cars is from the top. It is easier to shut off the flow in case of a transfer line leak or rupture. Figures 2–4 show several unloading arrangements for tank cars. This minimizes the chance of an accidental discharge. In Figures 2 and 3 the unloading lines are connected to the fixed well line in the tank car. For top unloading, an approach platform is suggested.

Figure 2

Tank Car Top Unloading
Fixed Piping With Swivel Joints

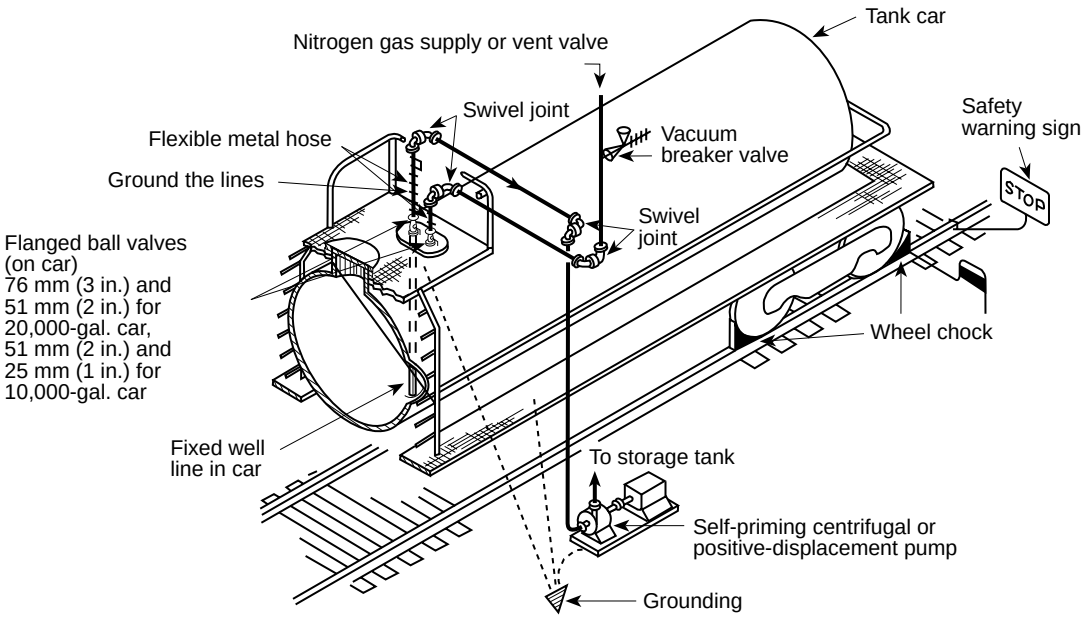


Figure 3

Tank Car Top Unloading
Flexible Hose With Flanged Elbow

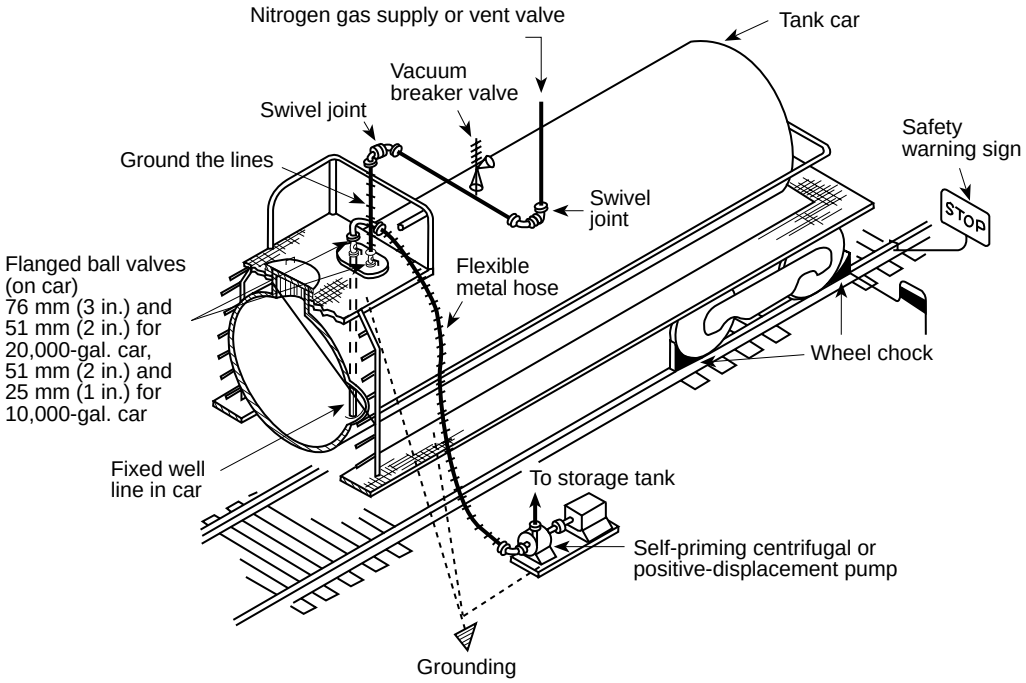
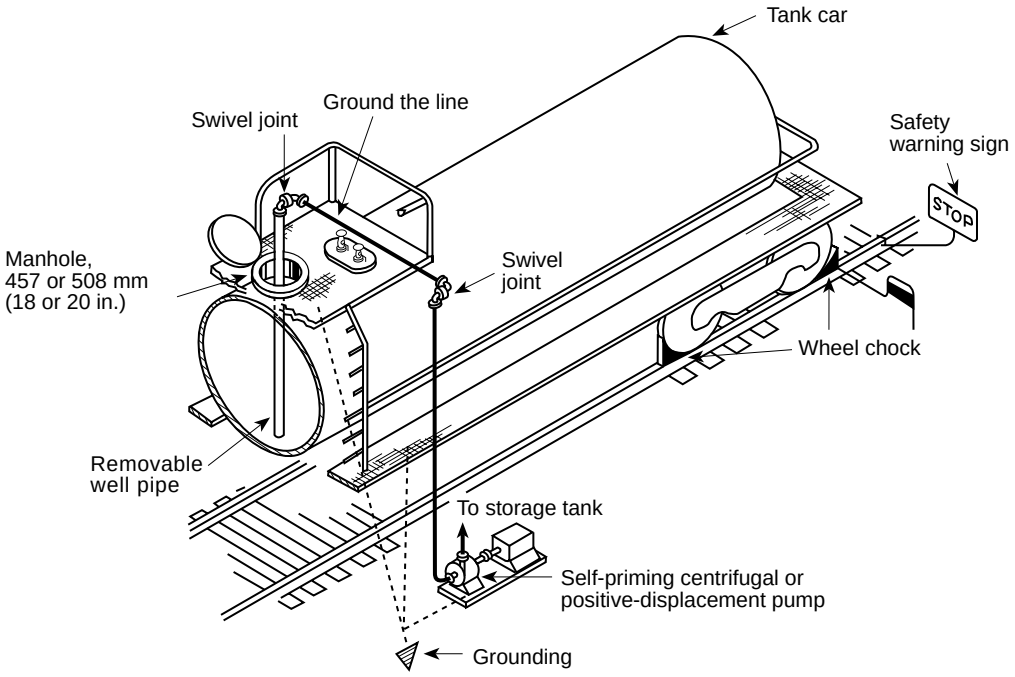


Figure 4*

Tank Car Top Unloading
Removable Well Pipe With Swivel Joints



*The unloading method shown involves lowering a well pipe through the open manhole of the car.

Suggested Unloading Guidelines for Tank Cars

1. Read storage tank liquid gauge and record reading. Convert inventory to gallons and make certain that tank will accept contents of tank car.
2. Spot tank car at unloading station and set hand brake. Apply chocks to wheels to help prevent travel of car in either direction. Position a warning sign on each side of car along rails and, if necessary, attach derailing device to rails or lock switch to the spur track involved.
3. Attach ground wires to tank car and platform.
4. Read and record tank car number, numbers on metal tape seals located at various openings on car, and product identification tags on manhole and bottom outlet. If these do not agree with information in shipping papers, check with shipper before unloading.
5. Depending on type of unloading facilities, connect flexible stainless steel hose to outlet valve on car, or lower well pipe through manhole.
6. If pressure unloading or using nitrogen purge, connect nitrogen supply; otherwise make certain car is vented. Open smaller ball valve next to top unloading line. If applicable, start nitrogen purge.
7. Open all valves in transfer line between tank car and storage tank.
8. Start pump and immediately check transfer line for leaks. If pressure unloading, begin pressuring tank car with nitrogen. Be sure relief valves on tank car and storage tank are properly rated for nitrogen supply pressure.
9. Check liquid level gauge on storage tank to ensure liquid is being transferred.
10. When tank car is empty, stop pump. If applicable, stop nitrogen purge. Close unloading and vent valves on tank car. If applicable, bleed pressure off nitrogen purge line and disconnect nitrogen purge.
11. Connect nitrogen to unloading line and blow nitrile from unloading line into storage tank. (Residue in unloading line should not be released onto the ground.)
12. Disconnect flexible hose or raise well pipe. Close up car to its original condition. Remove chocks, warning signs, derails, and switch locks.
13. Read storage tank liquid level gauge and record reading.

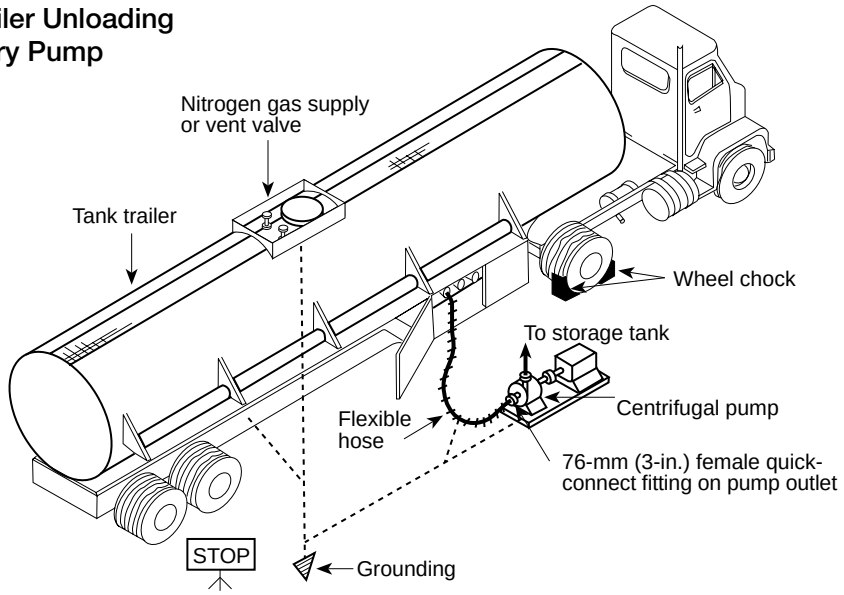
Tank Trailer Unloading

A cargo tank should be attended by a qualified person at all times during unloading, for example, per United States regulations 49 CFR 177.834(i)(2) or applicable regulations in your country.

Tank trailer unloading connections are shown in Figure 5. Because the truck engine adds an additional ignition source, the pump on the tractor should not be used to transfer liquid from the trailer to the storage tank.

Figure 5

Tank Trailer Unloading Stationary Pump



Suggested Unloading Guidelines for Tank Trailers

1. Read storage tank liquid level gauge and record reading. Convert inventory to gallons and make certain that tank will accept contents of tank trailer.
2. Position tank trailer at unloading station and set hand brake. Apply chocks to wheels to help inhibit travel in either direction.
3. Attach ground wire to tank truck and platform.
4. Read and record tank trailer number, numbers on seals located on various openings on trailer, and product identification tags on manhole and bottom outlet. If these do not agree with information in shipping papers, check with shipper before unloading.
5. Connect flexible stainless steel hose to tank trailer outlet and to quick-connect fitting on inlet of customer's pump (Figure 5).
6. Make certain flexible hose connections are connected properly. If using nitrogen purge, connect nitrogen and start purge or open vent valve to atmosphere. Open valves in line between trailer and storage tank.
7. Open trailer manual outlet valve and trailer hydraulic outlet valve.
8. Start pump and immediately check transfer lines for leaks. Check storage tank liquid level gauge to ensure liquid is being transferred.
9. When tank trailer is empty, have driver close hydraulic outlet valve and stop pump. If applicable, stop nitrogen purge. Close vent valves. If applicable, bleed pressure off nitrogen supply line and disconnect nitrogen purge.
10. Connect nitrogen to unloading line and blow nitrile from unloading line into storage tank.
11. Close valves in transfer line and disconnect flexible hose. (Residue in transfer line should not be released onto the ground.)
12. Remove chocks from trailer wheels.
13. Read storage tank liquid level gauge and record reading.

Safety Precautions

Material Safety Data Sheets (MSDS) providing toxicity information, physical and chemical data, and spill and emergency response information are available for Eastman isobutyronitrile and n-butyronitrile. User should review these publications before undertaking to handle, store, or use any of these materials. For copies, write or call your Eastman representative.

Toxicity Information

NBN and IBN are considered to be highly hazardous materials since they can release cyanide following absorption into the body. Both materials are well absorbed by skin contact, inhalation, and ingestion. In addition, IBN has caused the death of laboratory animals exposed to the liquid by direct eye contact. Initial symptoms of overexposure to these and other nitriles include headache, dizziness, weakness, giddiness, confusion, difficulty breathing, cyanosis, abdominal pain, nausea, and vomiting. Direct skin and eye contact may cause slight, transient irritation.

The U.S. National Institute for Occupational Safety and Health (NIOSH) has issued a Recommended Exposure Limit (REL) of 8 ppm as a time-weighted average (TWA) for both NBN and IBN.

It is extremely important that all the precautionary information in the MSDS (especially the first-aid procedures) be read and understood prior to handling or using either of these nitriles and that users have available a cyanide antidote package[1] and a plan for obtaining immediate medical assistance in case of accidental exposure.

Personal Protection

It is recommended that IBN and NBN be handled and used only in closed equipment. Personal protective equipment required during both tank car and tank truck offloading are a full-face positive-pressure air-supplied respirator, chemical-resistant gloves, and rubber boots. Full protection is required by all personnel involved in the handling operation. Consult the MSDS for additional information.

Technical Assistance

If you have questions concerning bulk storage or handling of isobutyronitrile and/or n-butyronitrile, contact your Eastman representative.

[1] *Available in the United States from Akorn, Inc./Taylor Pharmaceuticals (www.akorn.com)*

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Material Safety Data Sheets providing safety precautions that should be observed in handling and storing Eastman products are available online or on request. You should obtain and review the available material safety information before handling any of these products. If any materials mentioned are not Eastman products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

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