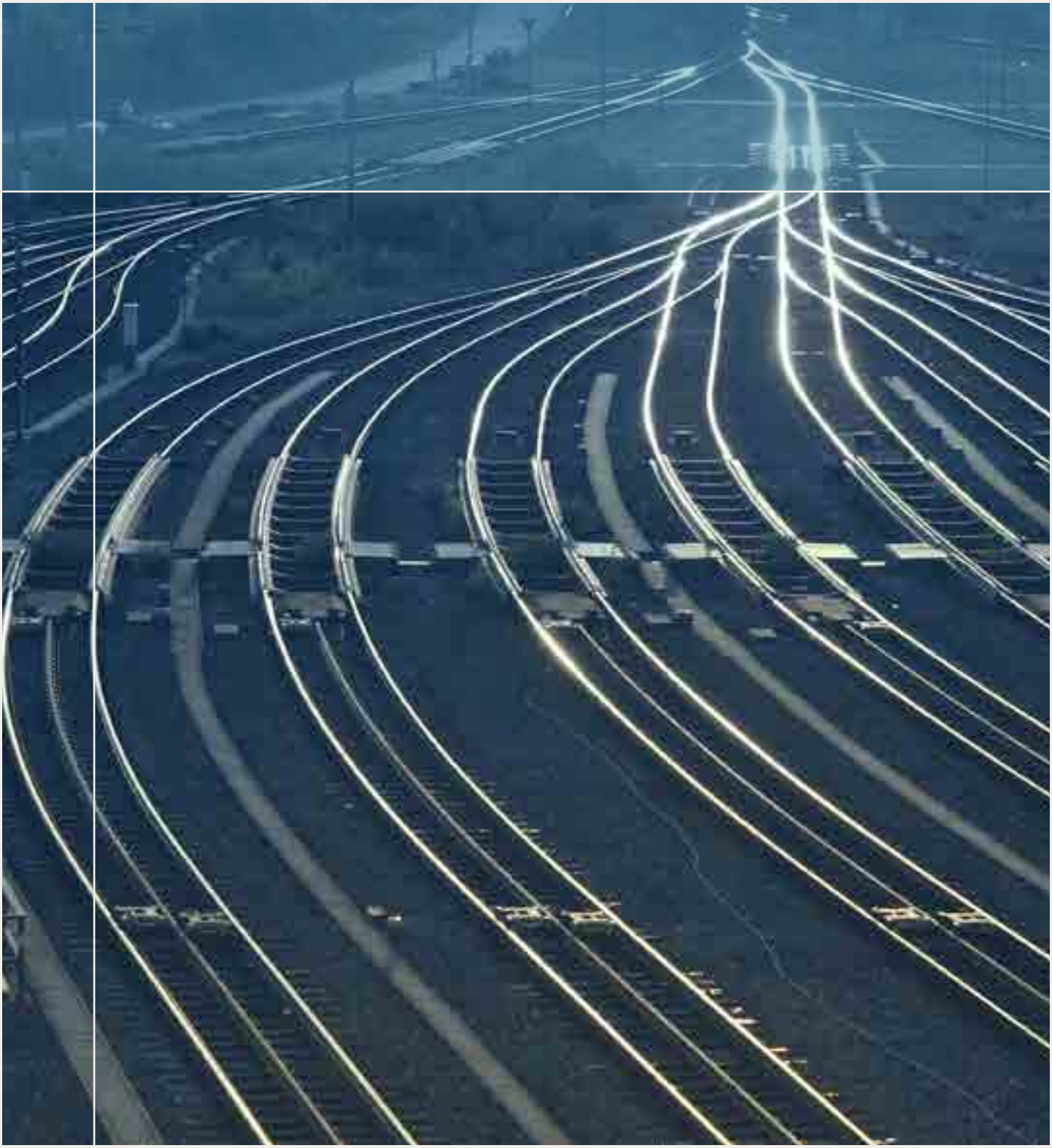
Guidelines for the distribution of

Propylene Oxide

Revision 3 - January 2013

Propylene Oxide/Propylene Glycols Cefic Sector Group



Member companies and notice

Member companies

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If there are national or international legal requirements on any of the recommendations stated in this document, these shall prevail.

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Appendices

1 Introduction

The Cefic (European Chemical Industry Council) Responsible Care Program requires that Chemical Companies demonstrate their commitment to continuously improve all aspects of Performance which relate to Protection of Health, Safety and the Environment.

An overview of the Key Elements of Cefic's Distribution Responsible Care Program is contained in appendix 1.

These Guidelines have been prepared by a Task Force under the direction of the Cefic Propylene Oxide Sector Group as their execution program with regard to the application of Responsible Care in the distribution of Propylene Oxide. They are consistent with the Cefic Recommendations on Safe Management Practices in Distribution and establish appropriately high standards of safety for the distribution of Propylene Oxide. The key elements of these Management Practices are contained in appendix 2.

Although Propylene Oxide is a hazardous material in terms of flammability, reactivity and toxicity, it can be distributed and handled safely provided that appropriate precautions are observed.

The Distribution of Propylene Oxide is already subject to regulations within most countries in Europe. In addition, the international movement of Propylene Oxide by road, rail, sea or river/canal is subject to international agreements which lay down specific requirements concerning distribution which must be observed by all parties involved. National regulations may differ from international regulations.

These Guidelines take into account the distribution of Propylene Oxide in bulk road tankers, rail tank cars, sea tank ships, barges and tank containers. They cover all aspects of the transport activity from loading to delivery point. Reference to existing regulatory controls is only made where this is considered necessary for the purpose of clarification.

Since drum shipments are not carried out by the Sector Group Propylene Oxide manufacturers, specific distribution risk management requirements for drum shipments are not discussed in these guidelines. However, individual companies can offer advice upon request.

The Cefic Propylene Oxide Sector Group recommends that these Guidelines are adopted by all parties who are involved in the distribution of Propylene Oxide. This includes Commercial Transactions, Swap, Toll or Trade agreements and Customer Collection Arrangements.

The Sector Group Members will review these Guidelines on a regular basis.

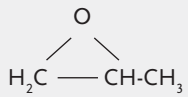
2 Product information

2.1 General Data

EINECS NUMBER	INDEX NUMBER	CAS NUMBER	SYNONYMS	FORM
200-879-2	603-055-00-4	75-56-9	1,2-epoxypropane epoxypropane methyl ethylene oxide methyloxirane 1, 2-Propylene Oxide	liquid

WARNING PROPERTIES
The odour of this material is inadequate to warn of excessive exposure.

2.2 Physical Properties

Formula	
Molar mass	58.08 g/mol
Melting Point (101.3 kPa)	-111.9°C
Boiling Point (101.3 kPa)	34.2°C
Flash Point (closed cup)	-37°C
Critical Temperature	209.1°C
Critical Pressure	4920 kPa
Critical Density	312 kg/m^3
Critical compressibility factor	0.2284
Auto ignition temperature in air at 101.3 kPa	449°C
Explosive limits in air (STP): - Lower - Upper	 1, 7 vol% 37.0 vol%
Heat of combustion (25°C 101.3 kPa)	-33035 kJ/kg
Heat of Polymerization	-1500 kJ/kg

Heat of fusion	112.6 kJ/kg
Heat of solution in water at 25°C	-45 kJ/kg
Heat of formation of the ideal gas (25°C)	-1600 kJ/kg
Heat of formation of liquid Propylene Oxide (25°C)	-2080 kJ/kg
Standard enthalpy (298.15K)	248 kJ/kg
Standard entropy (298.15K, 1 atm.)	4.94 kJ/kg -1 K-1
Free energy of formation (25°C, 101.3 kPa)	459 кkJ/kg
Cubic expansion coefficient at 20°C	0.00151 1/K
Solubility of Propylene Oxide in water at 20°C	40.5 wt%
Solubility of water in Propylene Oxide at 20°C	12.8 wt%
Density gr/cm^3 at 20°C	0.83
Relative vapour density (air=1)	2.0
Vapour pressure (kPa at 20°C)	57.7
Saturation concentration at 20°C	1360 g/m^3
Minimum ignition energy	0.13 mJ
Flashpoint of 1% aqueous solution	23°C

2.3 Flammability hazards

Propylene Oxide, a colourless highly volatile liquid with a sweet ethereal odour, is extremely flammable with a flashpoint of -37°C (closed cup) and a wide explosive range of 1.7-37 Vol % in air.
The vapour is heavier than air and spreads at ground level, with the risk of ignition at great distance and flash back.
Propylene Oxide has ignition energy of 0.13 mJ.

2.4 Reactivity hazards

Bases, acids or metal halides can cause violent polymerization. Propylene Oxide is presumed to be able to form peroxides and thus to polymerize. Do not use compressed air when filling, emptying or processing. Propylene Oxide reacts violently with oxidants, organic and inorganic acids, organic and inorganic bases, anhydrides, chlorides of iron, aluminium and tin, chlorine, amines, ammonia and alkali metals with risk of fire and explosion. Do not use clay based absorbent materials.

2.5 Toxicology and occupational health hazards

2.5.1 Health Effects

2.5.1.1 ACUTE TOXICITY

Acute toxicity data by oral, inhalation and dermal routes indicate that Propylene Oxide is hazardous. The studies for the oral and inhalation route performed in rats concluded an oral LD50 of 382-587 mg/kg bw and an LC50 of 9.95 mg/L, respectively. For the dermal route, an LD50 of 950 mg/kg bw was concluded in rabbits.

2.5.1.2 ASPIRATION HAZARD

Propylene Oxide is not an aspiration hazard based on expert judgment of several physicochemical properties of Propylene Oxide. Its viscosity is low (0.374 mm2/s), however other physicochemical properties, in particular high water solubility (>40%), and no reported cases in humans support that this substance is not an aspiration hazard.

2.5.1.3 IRRITATION / CORROSION

Propylene Oxide was tested in an in vitro skin corrosion test and concluded to be non-corrosive. In an in vivo skin irritation study in rabbits Propylene Oxide was considered not skin irritating. There are no conventional studies available that tested Propylene Oxide for irritation to the eyes and respiratory tract, however, exposure to the vapour has caused irritation of the eyes and upper respiratory tract in humans, and this has been confirmed by observations in animal studies. Accidental exposure of the eyes of 3 individuals to unspecified concentrations of Propylene Oxide (not stated if liquid or vapour) resulted in alterations in the cornea and conjunctiva, described as “burns”. In the case of one man exposed to Propylene Oxide vapour for 10 minutes, symptoms of respiratory tract and eye irritation were reported. Signs of eye and respiratory tract irritation were observed in a number of animal species at high exposure concentrations exposed to Propylene Oxide vapour in single and repeated exposure studies. Therefore the available date indicates this substance is potentially irritating to the eye and respiratory tract.

2.5.1.4 SENSITISATION

A small number of dermatitis cases in workers with repeated direct contact with liquid Propylene Oxide provide some limited evidence that Propylene Oxide may cause skin sensitisation; however, a study conducted in animals did not find skin sensitising effects.

2.5.1.5 REPEATED DOSE TOXICITY

Several long-term studies have been conducted for Propylene Oxide and the only consistent, toxicologically significant, non-neoplastic findings are local at the site of application. In rodent chronic inhalation bioassays, Propylene Oxide vapour produced upper respiratory tract clinical signs (e.g. dyspnea, gasping, rhinitis) and lesions (e.g. nasal cavity edema and inflammation, degeneration and necrosis of nasal cavity mucosal epithelium, squamous metaplasia and hyperplasia of the respiratory epithelium of the nasal mucosa and epithelium of the mucosal glands). In a chronic oral study conducted in the rat, the principal non-neoplastic findings associated with gavage dosages were reactive changes (epithelial hyperplasia) in the squamous epithelium of the forestomach.

2.5.1.6 MUTAGENICITY - GENETIC TOXICITY

Propylene Oxide has been tested for genetic toxicity in a number of in vitro and in vivo assays. Propylene Oxide is a monofunctional alkylating agent that is a weak genotoxin. The most abundant DNA adduct formed is N7-hydroxypropylguanine (N7-HPG), which is lost by spontaneous depurination, with the resulting apurinic sites being efficiently repaired. N7-HPG is not itself a pro-mutagenic DNA adduct. Other minor adducts, that may have promutagenic potential, are not formed in great numbers. Propylene Oxide has given positive responses in a multiplicity of genotoxicity tests, both in vitro and in vivo, for both non-mutational and mutational endpoints, however, most studies have been at high exposure concentrations and/or have employed repair deficient organisms, e.g., in the Ames test. No in vivo

genotoxicity study in rodents or monkeys, administering Propylene Oxide by a physiological route, has been positive including a 2-year inhalation exposure study of monkeys to 300 ppm Propylene Oxide. The general toxicological profile for Propylene Oxide suggests that its potential to produce genetic damage might be expressed only at sites of initial contact. In relation to the potential of Propylene Oxide to induce heritable mutations in germ cells, dominant lethal tests involving repeated inhalation exposure of rats and repeated oral exposure of mice have given negative results. There is no additional evidence that Propylene Oxide causes heritable mutations in germ cells. However, studies of DNA adduct formation in rodents indicate that DNA adducts were observed in all tissues, including at very low levels in the testes, following repeated inhalation exposure to 500 ppm Propylene Oxide vapour.

2.5.1.7 CARCINOGENICITY

Propylene Oxide is a rodent carcinogen selectively producing tumour only at sites of contact. There are no traditional epidemiology studies available with cohorts exposed only to Propylene Oxide, without other potentially confounding chemicals; however, there is no evidence that low dose exposures constitute health risks to humans. Inhalation studies in animals have shown that Propylene Oxide produces a spectrum of upper respiratory tract changes, from inflammation and degeneration to metaplasia and neoplasia. In mice the development of squamous cell carcinoma and adenocarcinoma as well as hemangioma and hemangiosarcoma in the nasal cavity occurred following exposure to 400 ppm for 2 years. In similarly exposed rats, there was evidence of papillary adenoma development in the nasal cavity. A similar study in a second strain of rats exposed to 300 ppm showed degenerative and hyperplastic changes of the nasal mucosal epithelium and a significant incidence of non-dose-related carcinoma at slightly more distal sites in the respiratory tract including the larynx, pharynx, trachea, and lung. Repeated oral administration by gavage in rats induced carcinoma in the epithelium of the forestomach. The mode of action for Propylene Oxide-induced rodent nasal tumours has been extensively investigated and the evidence supports a complex mode of action with a practical threshold. Direct genotoxicity may be necessary, but it requires augmentation by Propylene Oxide's associated toxicities for it to be made manifest. Cell proliferation and glutathione depletion (perhaps with resulting indirect genotoxicity), seem to be required. These associated toxicities appear to be the rate-limiting steps in tumour induction. Since these are also threshold effects, as clearly documented in the studies discussed above, the process of carcinogenesis overall will have a threshold.

2.5.1.8 TOXICITY TO REPRODUCTION- FERTILITY

Based on the results of a two-generation reproductive toxicity study in rats, it is concluded that Propylene Oxide does not exhibit reproductive toxicity, as no effects on fertility were observed at the highest tested dose (300 ppm).

2.5.1.9 TOXICITY TO REPRODUCTION- DEVELOPMENT

No adverse effects on development were noted in developmental toxicity studies conducted in rats and rabbits, administered this substance at dose levels up to 500 ppm during gestation.

2.5.2 Environmental Effects

2.5.2.1 ACUTE (SHORT-TERM) AQUATIC TOXICITY

Acute aquatic toxicity of Propylene Oxide has been assessed at three different trophic levels: fish, invertebrates and algae. LC/EC50 values ranged from 52-350 mg/l across the three trophic levels with fish being the most sensitive species (96h LC50 = 52 mg/l).

2.5.2.2 CHRONIC (LONG-TERM) AQUATIC TOXICITY

There are no studies available which assess the chronic aquatic toxicity of Propylene Oxide.

2.5.2.3 ENVIRONMENTAL FATE

Available data on the biodegradation of Propylene Oxide are somewhat variable with one valid study indicating that this substance is readily biodegradable, but in other studies biodegradation occurs at a slower rate. However, it can be concluded that Propylene Oxide is readily biodegradable based on the results of the OECD 301C MITI study. The log Kow value of Propylene Oxide is low suggesting a low tendency to partition to organic phases and therefore a low potential for bioaccumulation. Propylene Oxide is readily biodegradable in aquatic environments; hence it is not expected to be persistent in the environment. Therefore Propylene Oxide is not a PBT (Persistent, Bioaccumulative, Toxic) substance.

2.6 Emissions and degradation

Propylene Oxide is not known to occur naturally.

Occurrence of Propylene Oxide in the environment is expected to be mainly in the atmosphere due to fugitive emissions from production or further processing.

In the atmosphere, Propylene Oxide is indirectly degraded by reaction with photo chemically produced hydroxyl radicals. The half-life of Propylene Oxide in the atmosphere is estimated to be 13 - 35 days. Propylene Oxide is not expected to contribute to ozone depletion.

In water, Propylene Oxide is hydrolyzed to Propylene Glycol with an estimated half-life of 4 - 12 days. Biodegradation under aerobic static laboratory conditions is moderate to high. According to MITI, Propylene Oxide is readily biodegradable. The chloride ion in salt water accelerates the chemical degradation with a half-life of 2 - 4 days, as well as basic and acidic condition. Further more Propylene Oxide is eliminated from water by volatilisation with a half-life of 3 days for rivers and up to 18 days for lakes. Propylene Oxide toxicity to fish or daphnia is low.

Propylene Oxide rapidly evaporates from dry surfaces and is moderately volatile from wet surfaces.

Propylene Oxide is expected to be very mobile in soil. In moist soils, hydrolysis will be the most significant degradation process.

Accumulation in biological or environmental systems is not to be expected.

2.7 International transportation regulations

ADR / RID / ADN	
PROPER SHIPPING NAME	Propylene Oxide
UN N°	1280
CLASS	3
PACKING GROUP	I
LABEL	3
HAZARD ID. N°	33

Fig. 1 **Legend table of a Propylene Oxide rail car**

IMDG	
PROPER SHIPPING NAME	Propylene Oxide
IMO/IMDG CLASS	3
PACKING GROUP	I
LABEL	3
UN N°	1280
TANK TYPE	UN-T11, (IMO-1) - Test Pressure (bar): 6.0
MARINE POLLUTANT	No

IBC CODE	
Proper shipping name	Propylene Oxide
IMO/IMDG Class	3
UN N°	1280
TANK TYPE	2G
SHIP TYPE	2
POLLUTION CATEGORY	Y

IATA	
PROPER SHIPPING NAME	Propylene Oxide
ICAO/IATA CLASS	3
UN N°	1280
PACKING GROUP	I
LABEL	Flammable Liquid

Remarks: Sample shipment not allowed by mail

2.8 Classification and labelling / special risks / safety advice

EU-GHS AS PER REGULATION (EU) NO. 1272/2008	
Classification	Flammable Liquid 1 Acute Toxicity 4* STOT SE 3 Skin Irritation 2# Eye Irritation 2 Carcinogen 1B Mutagen 1B
Symbol(s):	
Signal word	Danger
Hazard statements	H224: Extremely flammable liquid and vapour. H302: Harmful if swallowed. H312: Harmful in contact with skin.* H315: Causes skin irritation.# H319: Causes serious eye irritation. H335: May cause respiratory irritation. H332: Harmful if inhaled.* H340: May cause genetic defects via the intraperitoneal route only. H350: May cause cancer.
Precautionary statements	P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P280: Wear protective gloves/protective clothing/eye protection/face protection. P210: Keep away from heat/sparks/open flames/... /hot surfaces.... No smoking. P233: Keep container tightly closed. P243: Take precautionary measures against static discharge.

* According to EU CLP (Regulation (EC) No. 1272/2008), the existing classification is Acute Toxicity, Category 4, H302, 312, H332. However, the acute inhalation value, under EU CLP (Regulation (EC) No. 1272/2008, should place Propylene Oxide into Acute toxicity Category 3, H331. Similarly, the acute dermal toxicity key study endpoint value should place Propylene Oxide into Acute Toxicity Category 3, H311.

Skin irritation data do no justify classification, however in accordance with the existing EU CLP (Regulation (EC) No. 1272/2008), classification is required.

3 Transport and storage operations

3.1 Loading operations

3.1.1

The operation of filling of any road tanker, tank container, railtankcar or barge / vessel with a dangerous substance is a potential hazard. It is therefore important that loading facilities and transport equipment are correctly designed and constructed, and properly used and maintained.
Loading facilities should be situated at a safe distance from storage tanks. Loading facilities at terminals should have a remote controlled shut-off valve between the storage tanks and the loading vehicles.
For loading and unloading operations (PO selectively coded) dry disconnect couplings (NATO standard 3756) are the European standard (liquid: 3 inch selectivity code 3-5; gas: 2 inch selectivity code W; Gasket: Chemraz 505) ADR & RID dictates the present of three closing devices. Pressure retaining caps are strongly recommended.

3.1.2

The recommended design and construction of transport equipment is described in appendices 6 to 8 of these Guidelines. Equipment that meets the requirements of the ADR, ADNR, RID and IMO Regulations is subjected to periodic inspection and testing requirements as laid down in these Regulations. These inspections and tests are carried out by certified bodies.

3.1.3

Written operating instructions should be available for all filling points covering the loading of Propylene Oxide into bulk road tankers, tank containers, rail tank cars, barges or vessels, and personnel involved should be fully trained in their use. The instructions should recognise the specific hazards of Propylene Oxide, and ensure the correct operation of filling equipment in both normal and emergency situations.

3.1.4

All necessary protective clothing and emergency equipment should be available for loading operations. Personnel should be trained in the correct use of this clothing and equipment.

Fig. 2 **Dry Disconnect Coupling connection**

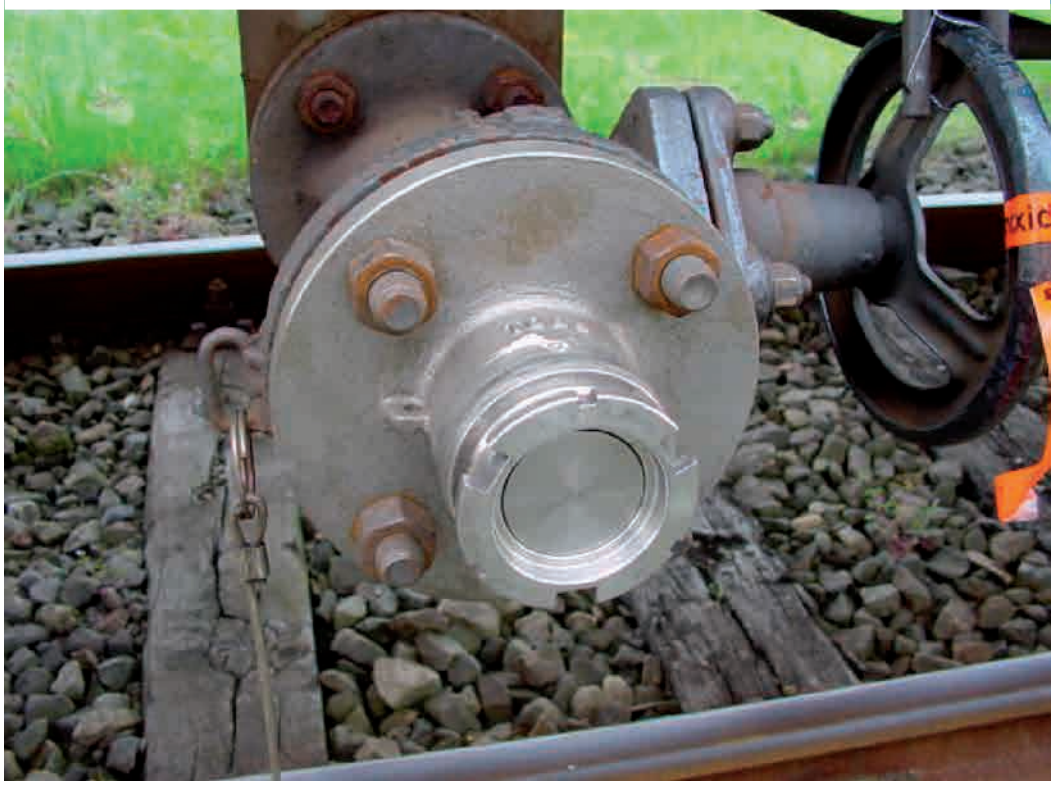


Fig. 3 **Dry Disconnect Coupling equipment**

Fig. 4/5 **Worker in protective clothing, connecting DDC liquid connection**

3.1.5

It is not the intention in this Section of these Guidelines to attempt to set detailed operating instructions for loading Propylene Oxide, since these, of necessity, will depend upon local situations. However, as part of the operating instructions, an inspection of the transport equipment should be carried out by the loading terminal staff before, during and after loading. This inspection does not replace nor diminish the responsibility of the owner of the road tanker, tank container, rail tank car, barge or vessel to ensure that the equipment is properly tested, maintained and fit for purpose. It is meant to ensure that the transport of Propylene Oxide is conducted as safely as possible. The inspection list detailed in appendix 3 is recommended for use by the supplier to check the condition of the Propylene Oxide transport equipment, and this should apply to the loading operations of rail and road mode.
Barges and vessels have specific checklists according to ADN/IMO regulations.

3.1.6

The inspection list assumes that Propylene Oxide is to be conveyed by international transport. In circumstances where Propylene Oxide is to be conveyed nationally, in accordance with regulations, which may differ from the requirements laid down in international transport agreements, the inspection list should be modified as appropriate.

3.2 Transport of Propylene Oxide by road

3.2.1

The carrier is responsible for the safe transport of Propylene Oxide by road from the loading point to the discharge point. Road carriers must meet all relevant national and international regulations relating to Propylene Oxide. Road carriers should preferably have a Quality system (like ISO 9000) and participate in an SQAS scheme. Cefic guidelines provide a framework for the implementation of the principles of Behaviour Based Safety (BBS) (http://www.cefic.org/en/transport-and-logistics-best-practices-guidelines.html) to safe driving of road freight vehicles. BBS is a programme aimed at increasing safety during transport by positively influencing the behaviour of drivers through observation, coaching and communication.
For reasons of unwanted reactions, contamination must be avoided. Therefore, only dedicated road tankers and tank containers must be used for Propylene Oxide. Transport equipment has to be held under (positive) nitrogen/PO vapor pressure at all times (to avoid air ingress). All connections should be sealed (see appendix 3).

3.2.2 Routing

The transport of Propylene Oxide has to follow the ADR regulations. Propylene Oxide should only be transported on defined routes. The route to be followed must be selected carefully and should be known to both the carrier and the consignor.

As far as possible, the route should:

a) Utilise motorways,
b) Avoid areas of high population density.

3.2.3 Severe Weather conditions

When severe weather conditions occur during transport, for example icy roads, snow or poor visibility, the delivery has to be stopped at the next suitable parking place.

3.2.4 Delays or accidents

All delays during transport, whether due to severe weather conditions, breakdown or other reasons must be reported to the consignor as soon as possible.
Transport accidents must also be reported to the consignor as soon as possible.

3.2.5 Emergency procedure

If emergency action needs to be taken by drivers when leaks, spills or fire occur during transport, then the instructions given in the "Instructions in writing" must be followed.They are available in various languages at the following web site: http://www.unece.org/trans/danger/publi/adr/adr_linguistic_e.htm

3.2.6 Ferry selection

The consignor will ensure that he knows which ferry operators are being used by the road carrier and will satisfy him of their suitability.

3.2.7 Customer collection

Customer collection should be avoided, except for co-producers.
However, if such collections take place, appendix 3 should be used.

3.2.8 Multimodal transport

Tank containers are often transported in a multimodal system. This is generally organised by the carrier. Management systems shall be in place to ensure quality and safety of operations by the carrier for the complete supply chain. This system should preferably be checked by means of an SQAS.

3.2.9 Subcontracting

Contractual arrangements between consignor and carrier should explicitly state that transport must not be subcontracted without prior approval of the consignor.
The subcontractor must fulfil the same requirements as the principal contracting carrier.

3.3 Transport of Propylene Oxide by rail

3.3.1

The appropriate railway companies, freight forwarders and authorities are responsible for the safe transport of Propylene Oxide by rail from dispatch location to final reception facilities. For reasons of unwanted reactions, contamination must be avoided. Therefore, only dedicated rail tank cars must be used for Propylene Oxide. Transport equipment has to be held under (positive) nitrogen / PO vapor pressure at all times (to avoid air ingress). All connections should be sealed (see appendix 3).

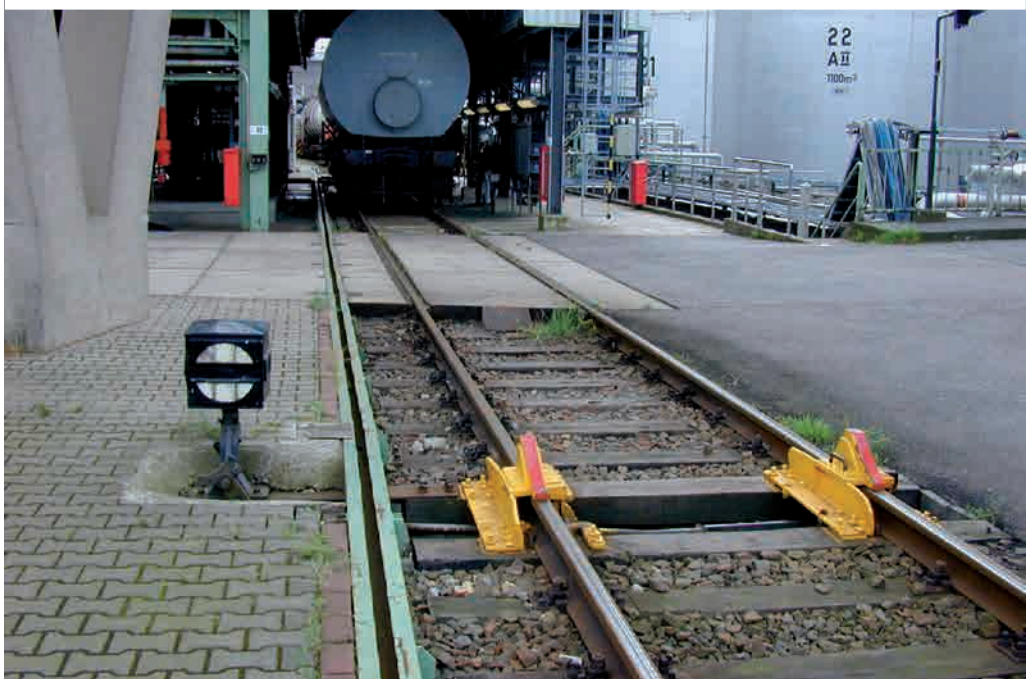
The selection of route, intermediate stopping locations and delay of traffic due to severe weather conditions are matters to be decided by the railway companies and authorities.

As SQAS Rail is now available, it should progressively be used.

3.3.2

The consignor will ensure that they are informed which rail-ferry operators the national railways are using.

Fig. 6 **Derailer at a filling station to prevent other railcars from entering the loading station**



3.4 Transport of Propylene Oxide by sea

3.4.1

Transport of Propylene Oxide by sea may be either:

a) By roll on/roll off ferries, or
b) Lift on/lift off shipment in tank containers
c) Bulk by seagoing vessels.

3.4.2

Because of the nature of the transport, a number of different parties may be involved in the transport of Propylene Oxide from consignor to customer. These may include the shipping company, port or harbour authorities and carriers.

3.4.3

Prior to the commencement of each traffic flow; the consignor should make sure that all parties involved have adequate Safety, Health and Environment standards.

Particular areas of interest are:

a) The shipping company
b) Loading/unloading facilities at container terminals
c) Emergency handling within hazardous cargo yards at container terminals
d) Emergency handling on board.

The Safety, Health and Environment system should preferably be checked by means of a CDI-Marine inspection.

3.4.4

The consignor should issue specific instructions for the control of the operation to all parties involved and the actions to be taken in the event of an emergency.

3.4.5

Transport by sea and inland waterways in bulk requires a suitable ship or barge that is certified to carry Propylene Oxide. Refer to appendix 4 for details.

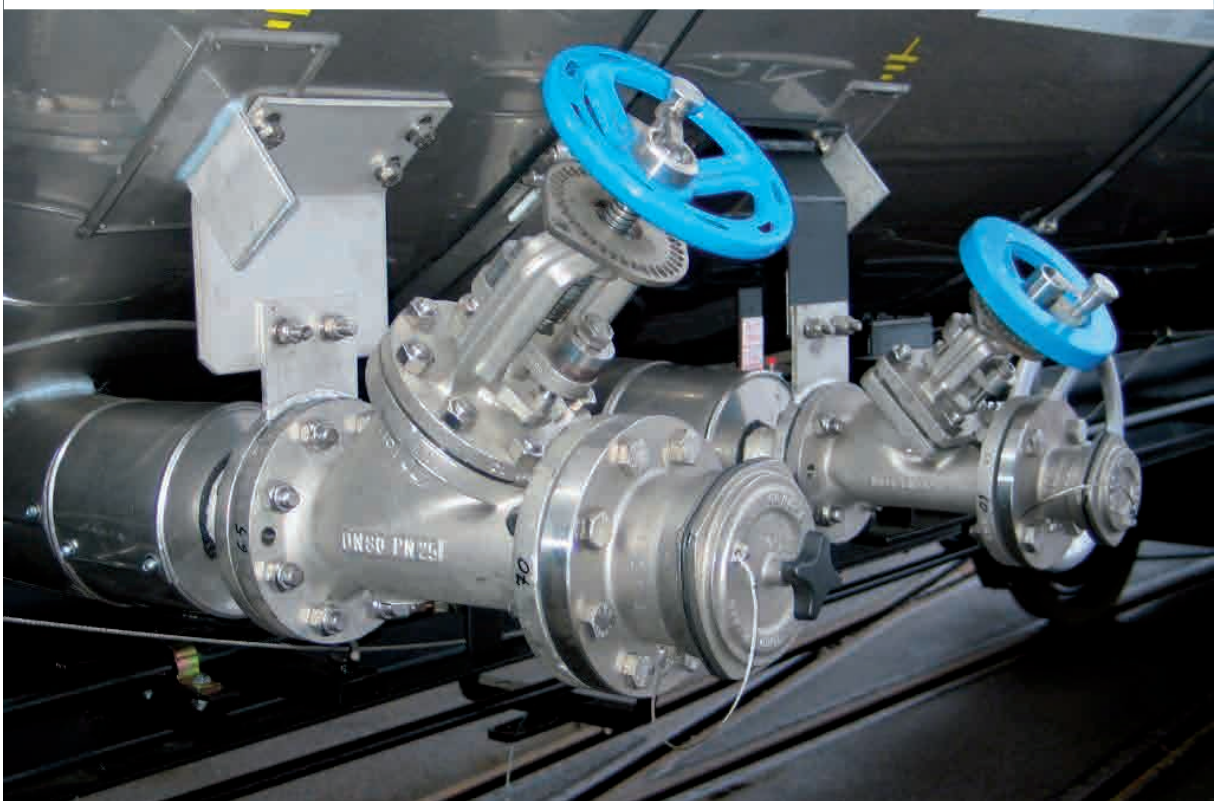
3.5 Unloading operations

3.5.1

The unloading of any road tanker, tank container, rail tank car, ship or barge of Propylene Oxide is a potential hazard. It is therefore important that unloading facilities are correctly designed and constructed, and properly used and maintained. Unloading facilities should be situated at a safe distance from storage tanks. Unloading facilities at terminals should have a remote controlled shut-off valve between the storage tanks and the loading/unloading vehicles (see chapter 4).

For loading and unloading operations PO selectively coded dry disconnect couplings (NATO standard 3756) are the European standard (liquid: 3 inch selectivity code 3-5; gas: 2 inch selectivity code W; Gasket: Chemraz 505) Pressure retaining caps are strongly recommended.

Fig. 7 **Dust caps**



3.5.2

Unloading facilities should be designed and located having due regard to the potential hazards associated with Propylene Oxide.
The equipment should be subject to regular and documented checks to ensure reliability.
Maintenance should be done by trained personnel.

3.5.3

Written operating instructions should be available for unloading Propylene Oxide from road tankers; tank containers, rail tank cars and ships as appropriate, and personnel involved should be fully trained in their use. The instructions should recognise the specific hazards of Propylene Oxide, and ensure the correct operation of unloading equipment in both normal and emergency situations.

3.5.4

All necessary protective clothing and emergency equipment should be available for unloading operations. Personnel should be trained in the correct use of this clothing and equipment.

3.5.5 Maintenance of transport equipment

Customers are requested to report any difficulties, which are experienced with the operation of valves, immediately to the consignor. The use of an information tag on the returning transport equipment identifying the problem can be of assistance (For more information, please refer to appendix 3.5).

3.5.6

The conditions for discharge of Propylene Oxide at a customer's premises are the customer's responsibility.
If the customer requires such, the consignor may provide him with technical advisory and safety service, which in principle may include an EH&S visit.
If an EH&S visit is made, the scheme included in appendix 4 may be used as a checklist. Normally the customer himself should evaluate whether his premises, especially his reception and storage facilities, correspond with the requirements of the scheme included in appendix 5.

4 Design and construction of transport and storage equipment

4.1 Current operating practices

The Propylene Oxide manufacturers use either equipment for the bulk transport of liquefied or pressurized gases (LG) or equipment for bulk liquid transportation of Propylene Oxide according to the applicable regulations.

4.2 Design and construction of railcars (rail tank cars)

Railcars for the carriage of Propylene Oxide must meet the design and construction requirements of:

a) National Regulations or Local Railway Administration Regulations, when used for national transport.
b) International Regulations, such as the International Regulations concerning the Carriage of Dangerous Goods by Rail (RID), when used for international transport.

In addition it is recommended that railcars are designed and constructed in accordance with the recommendations contained in appendix 6.

Fig. 8 **Blockade to fix a rail car together with a spiral spring handle, which closes the valves automatically when the rail car rolls away**

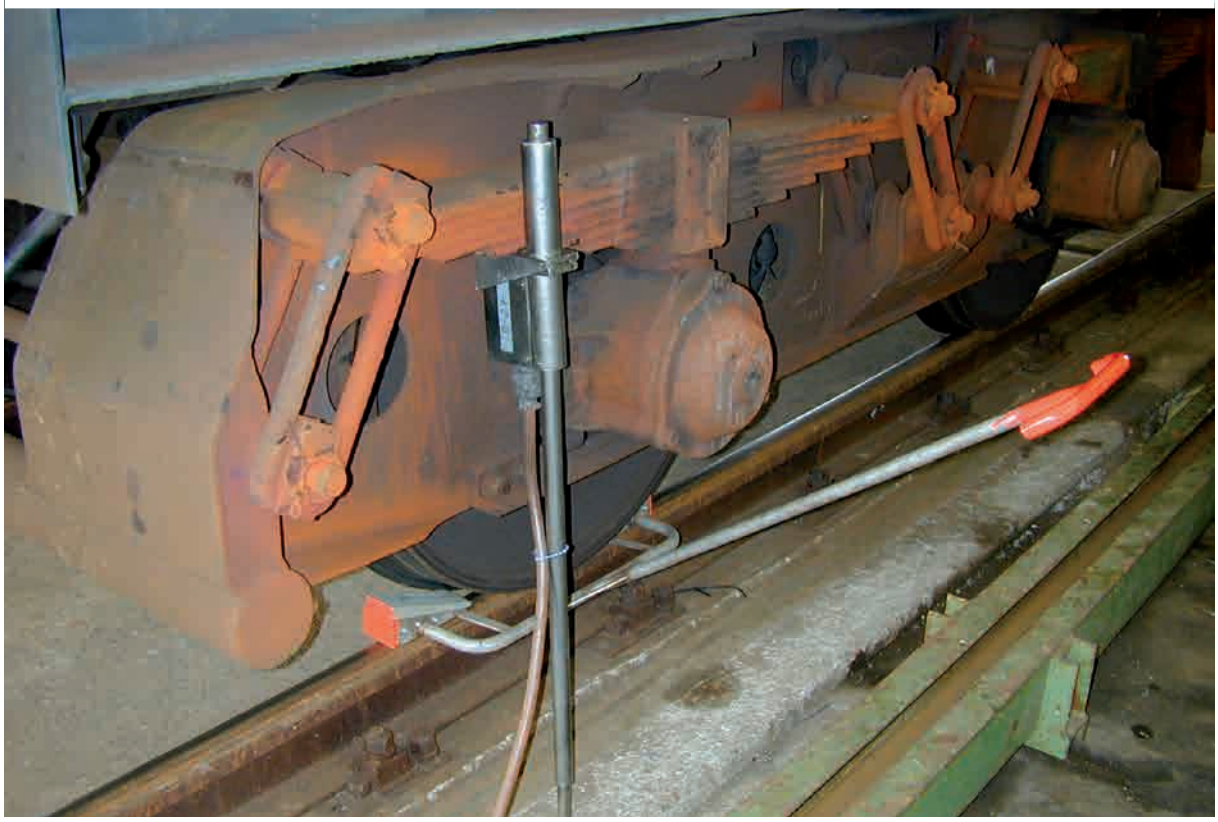
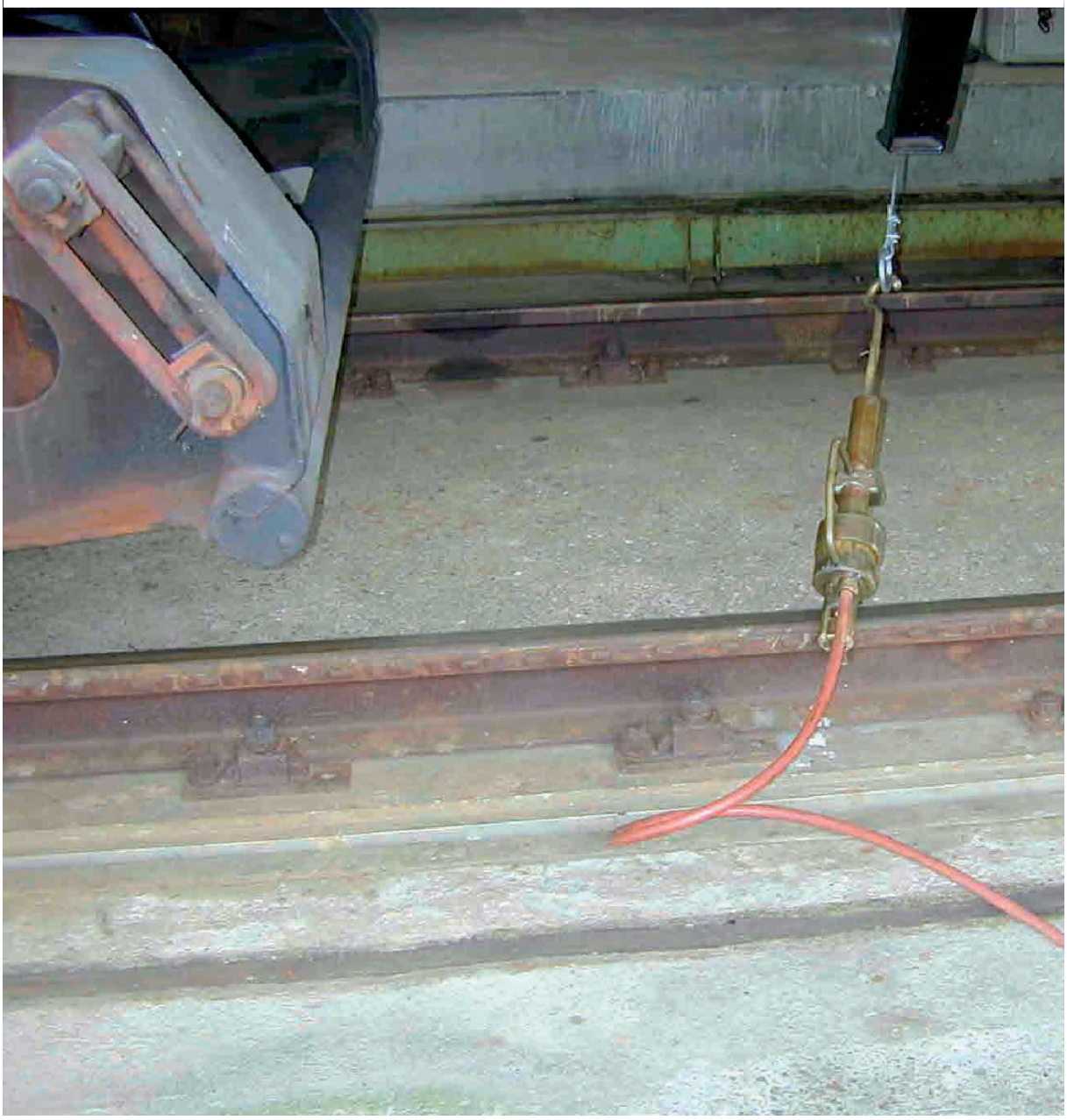


Fig. 9 **Rail hook combined with a remote control, which closes the bottom valve if activated. This example shows only the set up for liquefied gas railcars.**



4.3 Design and construction of tanktrucks (road tankers)

Tank trucks used for the carriage of Propylene Oxide by road must meet the design and construction requirements of:

a) National Regulations, when used for national transport.
b) International Regulations depending on the mode of transportation (e.g. shortsea voyage), such as the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), when used for international transport.

In addition to the above requirements, it is recommended that tank trucks are designed and constructed in accordance with the recommendations contained in appendix 7.

4.4 Design and construction of tank containers

Tank containers may be used for the carriage of Propylene Oxide by road, rail, and sea. They must meet the design and construction requirements of the appropriate National or International Regulations depending upon the specific transport modes which are to be utilized.

In addition to the above requirements, it is recommended that tank containers are designed and constructed in accordance with the recommendations in appendix 7.

4.5 Design and construction of vessels and barges

Vessels used for the carriage of Propylene Oxide by sea must meet the design and construction requirements of: International Regulations such as the international Code for the construction and equipment of ships carrying dangerous chemicals in bulk as produced by the International Maritime Organization (IMO).

Barges used for the carriage of Propylene Oxide by inland waterways must meet the design and construction requirements of National and International Regulations for the design and construction of barges such as the regulations concerning the Transport of Dangerous Goods by Inland Waterways (ADN).

In addition to the above requirements, it is recommended that the vessels and barges are designed and constructed in accordance with the recommendations contained in appendix 8.

4.6 Design and construction of storage tanks

The storage and handling of Propylene Oxide is subject to legislative controls in many countries. The design and construction of storage tanks for Propylene Oxide must therefore comply with national legislative controls.
The general guidelines contained in appendix 9 exemplifies the best general practice which is followed within the Propylene Oxide manufacturing industry and should be used provided it does not conflict with any specific legal obligation.

4.7 Design and construction of loading and unloading facilities

As transport and storage equipment have their own specific design and construction requirements it is essential to ensure the correct design of equipment for loading and unloading facilities. Loading and unloading facilities should be designed and located to meet appropriate engineering standards having due regard to the hazards associated with the handling of Propylene Oxide and the transfer rates which are to be achieved. Particular attention should be given to the ergonomics of connecting transportation equipment and to the health and safety protection of operators.

5 Emergency procedures

5.1 Emergency planning

5.1.1

All Propylene Oxide producers involved in transporting Propylene Oxide in Europe should have an established Emergency Plan for receiving transport incident reports and for providing expert advice by telephone and, as necessary, at the incident scene to the Emergency Services on how to minimize any danger arising from an incident on road, rail or waterway. The Cefic document "Distribution Emergency Response - Guidelines for Use by the Chemical Industry" provides advice on setting up a Company Emergency Plan.

5.2 Measures in the event of a release of Propylene Oxide

5.2.1

- Shut off all potential ignition sources and leaks, if without risk
- No open flames
- Stay upwind
- Isolate area and deny entry
- Prevent contact with eyes
- Avoid contact with skin
- Avoid breathing vapour.

5.2.2

- Dilute liquid spills with large amounts of water
- Use water spray to reduce the extent of vapour
- Avoid the use of clay-based absorbents
- Dike larger spills and recover
- Prevent entry into sewers and/or natural waters
- If substance has entered a water course or sewer, inform/advise Authorities.

5.2.3

By covering a liquid spill as quickly as possible with foam, evaporation and hence the formation of a flammable gas cloud can be prevented. The released liquid must then be recovered and transferred to sealable tanks or drums. Any remaining quantities of Propylene Oxide should be absorbed into suitable materials such as sand and transported in closed drums to a suitable processing installation. The recommended method of disposal is incineration.

5.3 Fire fighting

5.3.1

Do not put out any fire until leak is shut off. The reason is to prevent re-flash.

5.3.2

Cool containers exposed to heat / fire with water, to prevent overpressure / bursting.

5.3.3 Small fires

Use dry chemical or carbon dioxide (CO_2).

5.3.4 Large fires

Use water spray, fog or alcohol foam.

5.3.5 Massive fires

- Use unmanned hose holders or monitor nozzle
- Consider letting the fire burn out
- Dike liquid run-off
- Prevent entry into sewers and/or natural waters.

6 Personal protection, first aid and medical treatment

6.1 Personal protection

6.1.1

Eye protection: Use chemical resistance safety goggles.

6.1.2

Normal working clothes should be worn during routine handling.

6.1.3

Clothing for spill and fire:

- wear full protective clothing PO resistant gloves under gauntlet type Nitriles rubber gloves, rubber safety boots and approved positive pressure breathing apparatus
- remove contaminated clothing immediately, preferably under safety shower / fire hose spray, and wash before re-use
- destroy contaminated shoes and leather items

Review supplier safety data sheet for more information.

Fig. 10 **Fully protected operator**

6.2 First aid and medical treatment

Never give fluids or induce vomiting if patient is unconscious or is having convulsions.

Inhalation

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to medical facilities for immediate medical advice.

Skin contact

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician if irritation persists. Wash clothing before reuse. Destroy contaminated shoes. Seek medical attention immediately.

Eye contact

Immediate and continuous irrigation with running water for at least 15 minutes is imperative.
Prompt medical consultation is essential. Seek medical attention immediately.

Ingestion

If swallowed, rinse mouth and go immediately to hospital.
Inducement of vomiting to be indicated by a doctor only.

Note to physician

Causes central nervous system depression. If burn is present, treat as any thermal burn, after decontamination. Treat symptomatically. No specific antidote. Supportive care. Treatment based on judgement of the physician in response to reactions of the patient.

7 Training for road tanker and tank container drivers

The ADR agreement requires a valid dangerous goods driving license for all drivers of road tankers or transport units carrying tank containers with a total capacity of more than 3000 liters.

Before transporting Propylene Oxide, it is recommended that the driver is trained on the specific hazards of Propylene Oxide. This training should include security aspects according to 1.10 ADR and may contain the topics mentioned in appendix 11.

Appendix 1 Cefic and Responsible Care

1 Responsible Care - a public commitment

"Chemical companies shall demonstrate their commitment to continuously improve all aspects of performance which relate to protection of health, safety and the environment."

2 Prevention of accidents

Within Responsible Care, prevention is a prerequisite to Emergency Response. The Cefic-ICE (International Chemical Environment) prevention program provides a valuable tool in reducing the number of incidents during the distribution of chemicals, from the time they leave the factory gate until their arrival at the customer's premises.

3

The objective is to minimize the possibility for incidents to happen. Since most distribution activities are subcontracted and since compliance with regulations is a necessary but not a sufficient condition to prevent accidents, there is a need for uniform safety & quality criteria against which distribution companies are regularly assessed. Unlike ISO 9002, which concentrates on quality, at a level set by the individual distribution company, SQAS - Safety & Quality Assessment Systems - provide objective performance indicators, which allow the monitoring of continuous improvements.

4

Based on detailed questionnaires, distribution contractors can be assessed by a qualified third party. Questions relate to management, equipment and operations, split by: statutory requirements, additional chemical industry requirements and desirable items. Scoring results can be presented in different ways but it is up to each individual chemical company to evaluate the results according to its own standards.

The distribution contractors will include:

- Marine transport: Vessels and barges. (Ferries)
- Road transport: Road carriers
- Storage operations: Terminals/Warehouses
- Ferry operators

5 Emergency response

Although the chemical industry has a fine record in preventing chemical transport incidents, it is committed to continuous improvement. The ICE Emergency Response scheme, a cooperative program coordinated by Cefic, will provide emergency response across national boundaries. It aims to build upon the best existing prevention practices, preserve proven emergency response schemes and extend the best emergency schemes to countries where none exist.

The chemical industry makes its expertise available to authorities - who are normally in charge of the emergency - at three levels of assistance.

- Level 1: Remote information and general advice by telephone or fax
- Level 2: Presence of an expert who will provide advice at the scene of an incident
- Level 3: Actual help with equipment and personnel at the scene of an incident

For detailed information on this subject consult: the Cefic ICE - European Emergency Response Network: Operational National ICE schemes (www.Cefic.org).

Appendix 2 Cefic recommendations on safe management practices in distribution (SQAS)

These recommendations conform to the principles of Responsible Care and include the following topics:

1. Safety, health and environmental policies
2. Auditing
3. Risk reduction
4. Specification of packages, tanks and other equipment
5. Incidents evaluation
6. Codes and regulations
7. Control operations
8. Training
9. Selection and monitoring of Contractors
10. Data and information
11. Emergency Response
12. Information to the public

Although these Guidelines for the distribution of Propylene Oxide are product specific, it is essential that policies, systems and procedures as described in the Cefic recommendations on Safe Management Practices in Distribution are in place and well maintained.

Appendix 3 Inspection of transport equipment

1 Routine inspection of road tankers and tank containers at loading terminals

If any of the following conditions are not met, the loading operation must be stopped and the situation rectified before commencing loading.

A) BEFORE LOADING	
1.	Does the truck have any visual defects (e.g. lights and tyres in good condition)?
2.	Is there a valid ADR equipment-certificate for carriage of Propylene Oxide?
3.	Has the driver a valid ADR license for the bulk transport of dangerous substances of Class 3?
4.	For tank containers, is the CSC (Convention of Safe Container) tank plate valid?
5.	Are all 'dangerous goods' labels fitted (see Chapter 2.7), are the identification numbers 33 1280 attached, or the national identification plate in accordance with national regulations, and are the Instructions in Writing in all required languages on board?
6.	For combined ADR/IMO transport: are the IMO 'dangerous goods' labels fitted? Is the UN number attached as per these regulations?
7.	Does the driver have all the necessary items of protective clothing and safety equipment as specified by the Instructions in Writing? Document downloadable from http://www.unece.org/fileadmin/DAM/trans/danger/publi/adr/Instructions/English2011.pdf
8.	Is the equipment dedicated for transporting PO?
9.	Determine the maximum payload based on: • Tare weight • Route • Country of destination • Transport mode • Minimum and maximum filling degree • Volume of tank
10.	Are all the valves closed upon arrival?
11.	Can all valves be operated correctly?
12.	Are the loading/unloading valves leak proof?
13.	Is the tank placed at the correct loading position?
14.	Are the wheels of the truck blocked by wheel blocks or other tools?
15.	Is the road tanker or tank container equipped with Propylene Oxide selective dry disconnected couplings?
16.	Is the vehicle earthed? The earthing cable should be fitted and a satisfactory earth established before loading connections are made.

B) WHILST LOADING	
1.	Is the maximum degree of filling not exceeded?
2.	Is the minimum degree of filling in line with ADR 4.2.1.9.6 a?
3.	When filling transport tanks, an appropriate allowance should be made to the pressures indicated to allow for equilibration between the gas and liquid phases after the tank is sealed. This allowance will vary depending upon loading conditions, but may be of the order of 0.5- 1.0 bar. Even after unloading Propylene Oxide tanks should be maintained at a minimum overpressure of 0.2-0.3 bars by using nitrogen.

C) AFTER LOADING	
1.	Is the maximum gross weight not exceeded?
2.	Are all valves closed and blinded, with all bolts in place and are all dry disconnected couplings/metal caps in place?
3.	Are all openings sealed?
4.	Before disconnection, the loading arms/flexible hoses must be purged with nitrogen.
5.	Is the vehicle earthing removed? At the end of the transfer operation, the loading connections must be disconnected before the earthing cable is removed.

2 Routine inspection of rail tank cars (RTCs) at loading terminals

If any of the following conditions are not met, the loading operation must be stopped and the situation rectified before loading is allowed to continue.

A) BEFORE LOADING	
1.	Is the rail track secured to prevent collision?
2.	Is the RTC suitable for Propylene Oxide transport, e.g. in respect of maximum working pressure of tank? Is the inspection date not exceeded?
3.	Are all 'dangerous goods' labels fitted and are the identification numbers? 33 1280 attached? For RTCs in combined RID/IMO transport: are the IMO labels fitted?
4.	Determine the maximum payload based on: • Tare weight • Country of destination • Route • Transport mode • Minimum and maximum filling degree • Volume of tank
5.	Are all the valves on either side of the RTC properly closed and blinded upon arrival?

6.	In case of hydraulically or mechanically operated valves: Is the emergency bolt unused and stored in a safe position on the RTC chassis? (This emergency bolt may only be used to open the bottom valves in the case of an emergency. It is strictly forbidden to start loading with the internal valve blocked by the emergency bolt.)
7.	Can all valves be operated?
8.	Are the loading / unloading valves leak proof?
9.	Is the RTC placed at the correct loading position?
10.	Are the wheels of the RTC blocked by wheel blocks or other tools?
11.	Is the RTC equipped with Propylene Oxide selective dry disconnect couplings?
12.	Is the vehicle earthed? The earthing cable should be fitted and a satisfactory earthing established before loading connections are made.
13.	After connection, the loading arm / flexible hoses must be pressurized with nitrogen and the connections checked for leaks before transfer is allowed.

B) WHILST LOADING

1.	Is the maximum degree of filling not exceeded? See Chapter 2.7.
2.	When filling transport tanks, an appropriate allowance should be made to the pressures indicated to allow for equilibration between the gas and liquid phases after the tank is sealed. This allowance will vary depending upon loading conditions, but may be of the order of 0.5- 1.0 bar. Even after unloading Propylene Oxide tanks should be maintained at a minimum overpressure of 0.2-0.3 bars by using nitrogen.

C) AFTER LOADING

1.	Is the maximum gross weight not exceeded, concerning A, B, C or D grid?
2.	Are all valves closed and blinded, with all bolts in place and are all dry disconnect couplings / metal caps in place on either side of the RTC?
3.	Are all openings sealed?
4.	Before disconnecting, the flexible hoses must be purged with nitrogen.
5.	Is the RTC earthing removed? At the end of the transfer operation, the loading arm / hose must be disconnected before the earthing cable is removed.

3 Unloading

The same guidelines as in appendix 3 paragraph 1 and 2 (relevant items) should be used for preparing a checklist for the inspections of the transport equipment before and during unloading.

The conditions of discharge at customer's premises are the customer's responsibility.

1.	Are written operating procedures at the premises?
2.	Have personnel engaged in this operation been adequately trained?
3.	Has the product been positively identified as Propylene Oxide?
4.	In case of multiple possibilities at the discharge point has the correct discharge point been identified?
5.	Can the receiving tank(s) take the complete load?
6.	Is the driver available (road tanker) and within sight of his vehicle for emergency reasons?
7.	Has the content of the truck, RTC, barge or vessel been included in the emergency plan?
8.	Does the operating procedure contain actions if a problem develops i.e. stopping and closing the external discharge valves?
9.	Does the operator use an unloading checklist?
10.	Is the unloading site equipped with Propylene Oxide selective dry disconnect couplings? Have these been regularly been inspected and maintained?

4 Initial inspection of road tankers, tank containers and rail tank cars (RTCs)

Before road tankers, tank containers or RTCs are first introduced to Propylene Oxide service, or reintroduced to service following maintenance or repair, a responsible person from the loading company should seek confirmation of the following items:

a) Is the transport equipment identical in all respects with the general arrangement engineering drawing?
b) Have the correct packing's and gaskets been fitted?
c) Has the tank been properly cleaned? (Grit blasting and vacuum cleaning for carbon steel tanks, with no rust remaining; degreasing for stainless steel tanks).
d) Do all valves function correctly? It is recommended before starting with the first loading of a new or repaired vehicle a "take into service procedure" will be conducted.
e) Do all dry disconnect couplings function correctly?

Fig. 11 **Example of checklist**

PO Logistics Code Of Practice

Title	LCOP nr.	Revision: 1	Page	Process owner: A. van Prooijen
Operational readiness for PO isotank	**POX-OPS-71**	Date:20/12/04	1 of 1	Signature:

Date/ Time:	**Product: PO**
Isotank nr.:	

1.0 Operational readiness

		Yes	No	Responsibility
1.1	Has repair / maintenace carried out as requested?			Haulier
1.2	Is tank approval certificate updated or re-issued?			Haulier
1.3	Is tank approval stamp plate updated?			Haulier
1.4	Is the tank visually in good shape?			Haulier
1.5	Is a cleaning certificate available?			Haulier
1.6	Is tank internally dry & clean to accept PO?			Independent surveyor
1.7	Are manhole and all connections closed and sealed?			Haulier
1.8	Pressure test performed at 4 barg?			Haulier & confirmed by Indept. Surveyor
1.9	Purge with nitrogen to dewpoint -20°C			Load location & comfirmed by Indept. Surveyor
1.10	Has tank been purged to < 2% oxygen?			Load location

Haulier	Surveyor For 1.6 & 1.8	Surveyor For 1.9	Load Location
Signature	Signature	Signature	Signature

Document filing requirement **5 Year at load location**

5 Maintenance of transport / (Un)loading equipment

During operations, unscheduled maintenance of the transport equipment may be necessary if quick closing valves or bottom valves and dry disconnect couplings on road tankers/tank containers or RTC's cease to function correctly. Similar difficulties may be experienced with excess flow valves on tank containers and road tank cars.

Due to that, valves may become blocked with small amounts of polymer. Customers should be instructed to immediately report to the consignor any difficulties which are experienced with the operation of valves. The provision of an information tag on the returning transport equipment identifying the difficulty can be of assistance.
Consignors of RTC's should maintain close liaison with local railway authorities on all matters concerning the running gear of RTC's.

The O-rings of the PO selective dry disconnect couplings are recommended to be replaced at least every two years, followed by a vacuum test. This procedure is to be carried out at the loading and unloading location. The same is valid for the owner of the transport equipment.

Appendix 4 Guide for the marine chartering and handling of Propylene Oxide (PO)

Ships complying with bulk chemical codes

Inspection of all marine vessels for compliance with the Guidelines shall be made by a responsible and competent person prior to each loading to confirm a satisfactory condition of the vessels cargo system.

Ships that have never been in the company's service will be inspected by a Marine Surveyor, under the CDI scheme (see note) or a Company initiated scheme, to verify compliance with these guidelines and all applicable regulations prior to charter acceptance.

1 Certification

Propylene Oxide will only be loaded/carried on vessels meeting all currently applicable requirements and regulations of all applicable IMO codes and conventions, such as Bulk Gas Codes, Bulk Chemical Codes, SOLAS and MARPOL 73/78, and standards such as the U.S. Coast Guard Standard for the carriage of OXIDES.

The carriage of Propylene Oxide should be permitted by the vessel's International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, which should be valid for the expected duration of the voyage, state the carriage conditions for Propylene Oxide and be suitably endorsed. Alternatively a letter of compliance of the US Coast Guard or any other competent Flag State Authority can permit the carriage.

2 Prior cargoes

Documentation of the previous three (3) cargoes must be provided prior to the ships arrival at the loading berth. Propylene Oxide will not be transported in cargo systems which have contained as one of the three (3) previous cargoes any material known to catalyse the reaction of Propylene Oxide, unless adequate cleaning and inspection is possible and procedures to affect this have been issued.

Table 1 **Products known to catalyse polymerisation of Propylene Oxide**

ACIDS	ALKALIES	AMINES	AMMONIA
Hydrochloric	Caustic	Ethylamines	
Phosphoric	Sodium Hydroxide	Propylamines	
Nitric	Potassium Hydroxide	Ethyleneamines	
Acetic	and other metal	Methyleneamines	
Sulphuric	hydroxides and	and other Amines	
and other acids	solutions	and solutions	

See Table 1 for cargoes known to catalyse polymerisation of Propylene Oxide in the US Coast Guard Chemical Compatibility Chart

PRIOR CARGOES OF BUTADIENE, ISOPRENE AND STYRENE containing the polymerisation inhibitor tertiary butyl catechol are known to have resulted in contamination of Propylene Oxide cargoes.

A thorough methanol wash followed by a water wash has been shown to be effective in removing polymerisation inhibitor residues from some vessel tanks and cargo systems. Cargo tanks with extensive internal structural members or heavy rust accumulations will be extremely difficult to clean. A water wash will not effectively remove TBC residues.

3 Inspection, segregation and loading

Proper procedures for inspection, segregation of cargo and loading should be developed and used by the loader.

Prior to PO loading the cargo tanks ought to be purged with Nitrogen to <2% oxygen.

4 Carriage

Propylene Oxide must be maintained under Nitrogen blanketing within the ship's tank design pressure limits and the system relief valve.

A copy of the carriage log recording cargo tank(s) temperature, pressure and exceptions must be available at the discharge port.

The ship nitrogen supply used to pad the Propylene Oxide tanks shall contain less than 2000 ppm oxygen.

5 General information

Completion (balance) cargoes

Completion cargoes are cargoes shipped concurrent with Propylene Oxide. Compounds which are reactive with or that catalyse the self-reaction of Propylene Oxide are not desirable completion cargoes. Compatible cargoes are acceptable. (See US Coast Guard Compatibility Chart).

Adjacent cargo tanks that share a common bulkhead should not be heated above 30 °C.
(Note: the vapour pressure of Propylene Oxide is 760 mm Hg at 34.2 °C.)

Properties

Physical properties and other useful safety and health information relating to Propylene Oxide are contained in the Safety Data Sheets.

Propylene Oxide vapour is highly soluble in water. This property is useful for control of a vapour leak and for cleaning systems of Propylene Oxide. However, the introduction of water in a tank containing oxide vapour, through a spray system or cleaning machines could result in a collapse of the tank. The owner or master of the ship should be cautioned to exercise care in cleaning and washing tank to avoid creating a vacuum within the cargo tank. Use of an inert gas system is an acceptable method of purging tanks for cleaning.

Chemical distribution institute (CDI)

This is a system that provides objective information on the quality of shipping.

CDI is an independent system to select and monitor contractors involved in shipping. The system emphasises safety performance, environmental protection, regulatory compliance, maintenance and training.
A regular review of the above mentioned performance and necessary improvements are part of the system.

CDI accreditates inspectors and facilitates the distribution of assessment results.
Chemical companies or consignors can initiate an assessment and/or request the assessment results from the ships owner.

Appendix 5 A Safety Scheme for the reception and storage facilities at Propylene Oxide customers

1 ESAD / SQAS Guidelines

The European Single Assessment Document (ESAD) and the Safety & Quality Assessment Scheme (SQAS) have been developed jointly by chemical suppliers and distributors for use in one single assessment of distributors, offering simultaneously a measurement of the commitment of distributors to their Responsible Care Programme a common tool for suppliers to evaluate, against their individual requirements, the safety, health and environmental performance of their distributors.

2 Purpose

The Cefic Propylene Oxide Sector Group has developed a specific checklist for Propylene Oxide, which should be used for self-auditing by the customer. It can also be used as a guideline for the safety service of the supplying company.

3 Scope

3.1

This scheme shall apply to the reception of Propylene Oxide by road and rail at all customers.

3.2

The principal objective is to ensure that the transfer of Propylene Oxide from the delivering vehicle to the storage tank can be carried out safely. However, because the storage system and procedures may affect the safety of the unloading operation, these also need to be considered.

3.3

The scheme should also be used to:

a) Assess and record any changes in policy, attitude or equipment since the previous check.
b) Obtain customer's comments on the transport operation and equipment being used.

Propylene Oxide unloading/storage checklist

1. THE UNLOADING AREA	
1.1	Ease of access
1.2	Housekeeping
1.3	Separation from other activities
1.4	Ability to mobilise and remove road tanker/RTC in case of emergency
1.5	Facilities to isolate area and restrict access
1.6	Fire water / foam systems
1.7	Electrical classification
1.8	Minimum safety distances according to national regulations between the offloading point and: • Storage • Ignition source • Boundary fence/or other facilities
1.9	Adjacent offloading points
1.10	Hoses / loading arms / dry disconnect coupling
1.11	Earthing Point
1.12	Pipe damage protection
1.13	Other vehicles/fork lift truck movements
1.14	Communication systems
1.15	Shutdown systems

2. UNLOADING	
2.1	Personnel and equipment
2.2	The presence of customer's operator
2.3	Operator's competence
2.4	Deputy availability
2.5	Hose testing and renewal policy
2.6	Selectivity code of dry disconnect coupling
2.7	Fixed loading arm testing and maintenance
2.8	Availability of suitable safety equipment
2.9	Unloading lines should be properly labelled as Propylene Oxide
	OPERATIONS
2.10	Written procedures
2.11	Hose purging and leak testing
2.12	Sampling procedure

2.13	Atmospheric/personal Propylene Oxide exposure monitoring
2.14	METHOD OF UNLOADING: • Nitrogen Pressure • Pump
2.15	Use of rail hook (for LG equipment)
2.16	Safeguards for pump
2.17	Emergency response

3. NITROGEN SUPPLY

3.1	Source of nitrogen
3.2	Protection of nitrogen purity

4. STORAGE TANK

4.1	LOCATION • Bundled area • Shared • If shared, with what? Are they compatible? • Separation distances • Emergency disposal facilities
4.2	CONSTRUCTION • Insulated • Un-insulated • Refrigerated • Fire water / foam availability • Earthed • Maximum pressure rating • Maximum allowed working pressure • Date and type of last test/inspection • Dip inlet pipe
4.3	RELIEF VALVES • Separate • Combined with interlock • Size • Venting to: - Stack - Scrubber - Other • Flame traps • Nitrogen purged vents

4.4	INSTRUMENTATION • Nitrogen padding pressure • Control points: -Temperature -Pressure -Level • Alarm settings: -Temperature -Pressure -Level • Are control systems, and alarm systems independent?
4.5	MONITORING OF STORAGE • Temperature • Pressure • Available ullage (available space) in the tank

5. STORAGE TANK TO PROCESS

Precaution to prevent backflow from plant streams contaminating storage vessels

Measures to prevent contamination via the vent gas system

6. PROCEDURES

There should be written procedures available for the following:

- Unloading Propylene Oxide
- Testing, inspection and maintenance of equipment
- Emergency

7. COMMENTS

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Guidance notes for Propylene Oxide unloading/storage checklist

1. THE UNLOADING AREA	
1.1	There should be sufficient space for easy vehicular access.
1.2	Unless it is connected to the unloading facilities, it should be possible for the vehicle to be removed from the unloading area in the case of an emergency. If it is connected to the unloading facilities, then the emergency arrangements should take account of the contents of the vehicle.
1.3	Barriers, warning notices (e.g. no access; no smoking) are required. Special consideration may need to be given to prevent shunting close to the unloading area.
1.4	There should be a fire fighting system. Preferably this should be a permanent installation over/around the unloading area. Strategically placed fire hoses/monitors ready for use are acceptable.
1.5	The electrical classification shall be EX D2 G4; Division 1/Class C or equivalent.
1.6	All unloading points must be clearly labelled. If compatible substances are unloaded in the Propylene Oxide area procedures and/or engineering controls should be in place to avoid unloading of Propylene Oxide into wrong tanks.
1.7	Hoses or unloading arms should preferably be of stainless steel or so called “Cryoflex”. They should be dedicated to Propylene Oxide, have suitable gaskets (spirally wound PTFE or equivalent), have Propylene Oxide selective dry disconnect couplings and stored in such a way that contamination and damage will be prevented.
1.8	The earthing point should be checked on a regular basis.

2. THE UNLOADING	
2.1	The driver should be available during offloading and within sight of his vehicle for emergency reasons. He should not be in the cabin of his truck. Drivers must report back to the principal / consignor if noticed that unloading conditions do not meet the necessary safety requirements.
2.2	The customer’s operator must be present during off-loading or equivalent control measures executed e.g. such as camera supervision from a remote location and remote process control.
2.3 & 2.4	There should be at least two trained deputies to provide cover for illness and holidays.
2.5	The test pressure of the hoses should not be less than 1.3 times the maximum design working pressure. The frequency of testing is recommended as at least every 12 months.
2.6	Dry disconnect couplings with PO selectivity keys must be used.
2.7	Hoses must be purged with nitrogen and leak tested before commencing the discharge.
2.8	Air breathing sets with eye coverage, protective suits, boots and gloves of suitable material should be readily available (butyl rubber has been found to give the best degree of protection. Neoprene or natural rubber may also be considered for protective clothing, but may not remain as vapour-tight as butyl rubber, particularly after continued use. PVC offers only very limited resistance).
	A safety shower and eye fountain should be sited adjacent to the unloading area.
2.9 - 2.12	No additional comments.
2.13	If unloading is by pump, a dedicated vapour return system (balance line) should be used.
2.14	Rail hook only in connection with LG equipment (see chapter 4.1).

3. NITROGEN	
3.1	The purity of the nitrogen must be maintained.
3.2	The nitrogen should preferably be supplied by a separate and independent dedicated supply system. The Propylene Oxide nitrogen supply system **must not** be shared with supplies to amines, acids or other catalysts for Propylene Oxide polymerisation.
3.3	Ideally the supplies for storage and the plant should be taken from two completely independent sources. If this is not possible or the system is shared the integrity of the nitrogen supply system must be protected.
3.4	All nitrogen lines to storage and to process must be fitted with back flow protection for instance such as double block and bleed systems activated by a low positive pressure difference across the valves.

4. THE STORAGE TANK	
Some of this section falls outside the unloading safety checking procedure. However, the information is useful both from safety and quality viewpoints. It also provides information on the customer's competence and attitudes to safety.	
4.1	No additional comment.
4.2	Storage tanks are either pressure tanks or temperature controlled. Insulation is normally not required. However in case it has been installed, procedures shall be in place to detect and control under-insulation corrosion (e.g., wall thickness test or visual inspection). Especially in hot climates, refrigeration and / or closed cell structure insulation should be considered.
4.3	Relief valves should be large enough to meet local regulatory requirements e.g., the requirements for fire engulfment.
4.4	Level alarms are required.
	Procedures must be present which prevent tanks overfilling.
4.5	The temperature and pressure of the storage tank should be monitored regularly.

5. STORAGE TANK TO PROCESS
Back flow and contamination prevention is essential.
Similar equipment to that used for maintaining the nitrogen integrity should be used.

Appendix 6 Design and construction of rail tank cars

It is recommended that the company's technical railtankcar experts will use the following list of key railtankcar specifications in the contractual agreement with the different railtankcar lessons.

General recommendations

1

Tanks are generally constructed of carbon steel. No baffle plates are to be fitted.

2

Top or bottom loading/unloading facilities are used, depending on customer requirements.
(General practise in Europe is bottom unloading)

3

Sloped bottom to outlet to provide complete unloading.

4

In case of top loading/unloading facilities:

- Maintenance platform around top nozzles and manhole with galvanised anti-slip-grating and a kick plate. The holes in the grating must be sufficient to allow access for flange bolting.
- The top valves shall be designed in the longitudinal direction to allow operation of fixed liquid and vapour arms.
- One ladder with access to the platform shall be provided.
- Internal ladders are not recommended, as they will hinder the use of professional cleaning equipment.

5

Earthing connections shall be provided to prevent dangerous differences in electrical potential arising between the carrying tank, the body of the vehicle, the piping and the ground during the filling or discharging of the vehicle. Connections should be provided at each end of the tank and also adjacent to the discharge connections.

6

All valves shall be of a leak-tight design and have a dry-disconnect coupling + pressure cap or cover plate. Valves packing must be resistant to Propylene Oxide and all valves must be of a fire-safe design.

7

Insulation is not required, however if installed, verify protection/inspection of carbon steel corrosion under the insulation.

8

The right front side of the railtankcar shall be provided with a ladder and handgrips for the shunter.

9

Gaskets: PTFE, PTFE spiral wound or other PO compatible material.

10

Tank design according to ADR/ RID is L4BN (L= Liquid; 4= minimum calculation pressure 4 bar; B= bottom unloading and 3 independent closures; N = tank without a venting system according to 6.8.2.2.6 and not hermetically closed). This requirement is met by both LG and BL railcar types.

11 Equipment

11.1 PRESSURE RELIEF DEVICES

No pressure relief devices shall be fitted.

11.2 FILLING/DISCHARGE AND VAPOUR RETURN FITTINGS

11.2.1 The tank must be fitted with a DN80 filling / discharge pipe with a shut off valve. The vapour return connections shall be a DN50 pipe, fitted with a shut off valve. Valves shall be of an approved make & type, e.g. bellow valve.

11.2.2 In addition, a quick closing internal safety device shall be fitted in the tank shell for the liquid filling/discharge connection. The device shall be capable of being operated remotely. The device shall also close automatically in the event of a hose rupture or the inadvertent movement of the rail tank car. The valve actuator shall consist of a hydraulic system.

11.2.3 Both the filling/discharge and vapour return connections are equipped with PO selective dry disconnect coupling (NATO standard 3756) and a pressure retaining cap. Materials of connections must be similar to that of the tank shell. It is recommended to maintain the shut off valve in addition to the dry disconnect coupling.

11.2.4 Connections should be adequately protected against possible impact that may occur during transport. This protection could be provided by means of a strong steel guard or by utilising the chassis of the vehicle. Both the liquid and vapour connections shall be clearly marked by their name (liquid/ vapour). To ensure that the foot valves/internal safety devices remain closed should either of the connection pipes be damaged, the design should be such that if the pipes are subjected to excessive strain, the tank shell remains undamaged. Connection pipes, flanges and valves shall be suitable for the same test pressure as the tank shell.

11.3 INTERNAL VAPOUR RETURN PIPE

11.3.1 The tank pipe shall be fitted with a DN50 internal vapour return pipe which shall extend from the foot valve/internal safety device to the vapour space. The pipe shall be designed to restrict liquid entry and shall be supported so as to withstand any vibration during movement of the rail tank car.

12

For inspection purposes, the tank shall be fitted with one manhole not less than 500 mm diameter (gas type RTC's only), the manhole shall be fully bolted and may have a hinged design (right hand side).

Appendix 7 Design and construction of tank trucks and tank containers

It is recommended that the company's technical tank truck / tank container experts will use the following list in the contractual agreement with the different road carriers.

General recommendations

1

Stainless steel tank material is preferred, in order to facilitate cleaning operations.

2

Baffles may need to be fitted to meet the requirements of transport regulations. However, the number of baffle plates should be kept to a minimum, as they may hinder professional cleaning operations.

3

Bottom loaders / unloaders are preferred; they prevent working on top of the truck / container.

4

Top loading/unloading facilities are acceptable: At least one walkway of anti-slip grating shall be provided on top of the tank to give access to the top nozzles and man way. The walkway on tank trucks should be fitted with a collapsible handrail, and be reached by an open rung access ladder.

5

All valves shall be leak tight, resistant to Propylene Oxide and made of fire-safe design.

6

Earthing connections shall be provided. These connections shall not be painted.

7

Gaskets: PTFE, PTFE spiral wound or other PO compatible material.

8

UN tank instructions: T 11

9 Equipment

9.1 PRESSURE RELIEF DEVICES

Any pressure relief design must be in line with the requirements of the ADR / RID and the IMDG-Code.

9.2 FILLING / DISCHARGE AND VAPOUR RETURN FITTINGS

9.2.1 The tank must be fitted with a DN80 filling / discharge pipe with a shut off valve. The vapor return connections shall be a DN50 mm pipe, fitted with a shut off valve. Valves shall be of an approved make and type.

9.2.2 In addition, a quick closing internal safety device would be recommended in the tank shell for the liquid filling/discharge connection. The device shall be capable of being operated remotely. The device shall close automatically in the event of a hose rupture and it is recommended that it closes automatically in case of inadvertent movement of the road tankers/tank containers. The valve actuator shall consist preferably of a hydraulic system.

9.2.3 Both the filling/discharge and vapor return connections are equipped with Propylene Oxide selective dry disconnect coupling (NATO standard 3756) and a pressure retaining cap. Materials of connections must be similar to that of the tank shell. It is recommended to maintain the shut off valve in addition to the dry disconnect coupling

9.2.4 Connections should be adequately protected during transport. For tank containers, all connections should be contained within the ISO framework. Both the liquid and vapor connections shall be clearly marked by their name (liquid/vapor). These connections should be provided with means to prevent unauthorized access.

9.3 INTERNAL VAPOR RETURN LINE

The tank pipe shall be fitted with a DN50 internal vapor return line which shall extend from the foot valve/ internal safety device to the vapour space. The pipe shall be designed to restrict liquid entry and shall be supported to withstand any vibration during movement of the road tankers / tank container.

Appendix 8 Design and construction of vessels and barges

1 Vessels

Detailed Requirements for Marine movements of Propylene Oxide in gravity Vessels are contained in the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, under Chapter 15: Special Requirements. The 30 Topics list include requirements on design, inspection on cleaning quality prior to initial loading, cargo segregation, loading/unloading operations, refrigeration and nitrogen padding. The key requirements for Chartering and Handling are described in appendix 4.

2 Barges

The product specific requirements mentioned for vessels are also recommended for barge movements. In general these detailed requirements can best be met by using LPG Type Barges. It is recommended to consider using this barge type.

3 Vessels and Barges

Special attention shall be given to:

- Ship-Shore safeguarding systems
- Leak tight flanges of dome covers
- In line-sample systems

Appendix 9 General Guidelines for design and construction of Propylene Oxide storage tanks

1 Location of storage tanks

1.1

The arrangement and lay out of storage tanks should take into account:

a) Normal operation
b) Emergency operation
c) Fire fighting activities

1.2

The design of the tank farm should take account of the likely consequences of any accidental spillage or fire. Products that react chemically with Propylene Oxide, such as oxidants, acids, anhydrides, chlorine, and ammonia, should be kept in total segregated storage.

1.3

Storage tanks shall be located away from potential sources of ignition, and in a position so as to minimise the effect of radiation from any fire which could possibly occur in an adjacent area.

1.4

Storage tanks shall be discharged by pump. Tanks should not be elevated to allow gravity discharge, because of the difficulties of stopping gravity flow in the event of a fire.

1.5

Every tank shall be sited on an impervious base and should be surrounded by a bund wall capable of containing 110 % of its contents in the event of spill or leak. The walls and floor of the bund should be impervious to liquid and designed to withstand a full hydrostatic head. Bund walls should be designed to ensure adequate natural ventilation of the bunded areas, ready access for fire fighting, and good means of escape in any emergency situation.

1.6

Intermediate lower bund walls are recommended to divide tanks into groups to contain any accidental leakage and to minimise the surface area of any spillage. If tanks share a common diked area, products within the area should be chemically compatible.

1.7

The floor of the bund shall be sloped to prevent minor spillage's remaining below any tank. Provisions should be made for the removal or drainage of surface water from the area within the bund. Preferably, surface water should be pumped out of the bund with an appropriate pump. If bund drains are used, they shall be provided with valves outside the bund wall, with procedures in force to ensure these valves remain closed, except when draining is being removed.

1.8

No combustible materials, equipment, etc. shall be stored in the bund or against the bund wall.

2 Tank construction

2.1

The tank shall be of adequate strength and capacity for the proposed duty. The tank and its supports shall be designed and constructed in accordance with an appropriate nationally recognised standard of good engineering practice.

2.2

Copper and copper containing alloys shall not be used in Propylene Oxide service.

2.3

Storage tanks should be compatible with shipping and/or receiving requirements.

2.4

Vapour control systems shall meet local and/or governmental regulations. The vent system discharge should be preferably into a closed system or an atmospheric discharge at a safe distance from possible ignition sources.

2.5

Carbon steel storage tanks are generally the most economical for Propylene Oxide. Vertical storage tanks are often used for large volume storage. Horizontal tanks are also satisfactory for bulk storage, but these are generally used for small installations.

2.6

Tank filling shall be either from the bottom or with a vertical pipe extended to a designed distance from the tank bottom. It will ensure that Propylene Oxide can not fall freely through the vapour space with the hazard of electric discharges.

2.7

Insulation is normally not required, however in case it has been installed, inspection procedures shall be in place to detect and control corrosion. Closed cell structure insulation is recommended, as it does not lower the self-ignition temperature of Propylene Oxide in case of leakage.

2.8

In hot climate, large tanks with low throughput shall be protected against direct sun heating by using reflecting paint, a sun protection roof, or equivalent. In case of extreme high temperatures, insulation and a separate cooling-unit is recommended.

2.9

An accessible manhole of minimum 500 mm diameter shall be provided on all tanks to allow for internal inspection and cleaning.

2.10

Design of new storage tanks shall be based on full draining concept, sloped to outlet with no trapped areas. Eliminate "dead spots" of liquid and vapour phase in the system.

2.11

It is normal practice to fit tanks, which are storing highly flammable liquids, with a pressure relief valve (PRV) to protect the tank against overpressure. The design shall be according good engineering practice. For new tanks a rupture disc under the safety valve may be considered. This design eliminates the need for vent purging.

2.12

Each tank shall have a designed earthing system. Resistance to earth to be checked at least annually.

3 Storage tank engineering controls

Level, pressure and temperature measurement, nitrogen padding system

3.1

Storage tanks shall be provided with a suitable means of determining the liquid level, the pressure and the temperature in the tank.

3.2

Audible high level alarms, which automatically shut down the unloading process in the event of overfill, are strongly recommended. High/low pressure and high temperature alarms shall be fitted.

3.3

All storage tanks should contain local temperature and pressure indicators and temperature sensors for remote readings. It is recommended that level, pressure, and temperature recording equipment is provided in the control room.

3.4

A separate and preferably independent, dedicated nitrogen padding system shall be installed. The system design must prevent backflow.
If the prevention of a vacuum cannot be guaranteed, the tank should also be protected against vacuum with a vacuum-breaking valve.

3.5

It is desired to install either a low pressure snuffing steam system or nitrogen purge to all safety valve discharges. It will allow for dilution of potential Propylene Oxide vapours, especially during lightning. Design snuffing steam systems on freezing weather conditions.

4 Pipelines

4.1

All pipelines shall be adequately grounded, to discharge static electricity safely.

4.2

The tank discharge line shall be designed with an emergency block valve (EBV) which will shut off the tank contents in case of an emergency.

4.3

It is recommended that all gaskets used in the handling of Propylene Oxide are made of PTFE, stainless steel spiral wound with external guide-ring, or equivalent.

4.4

Wherever possible, continuous welded pipelines should be used. However where pipelines have to be disconnected for maintenance or inspection, flange joints should be fitted. Screwed fittings should not be used except for stainless steel instrumentation lines.

4.5

Pipelines should be routed to ensure that flanges are not located over doorways, windows or close to possible sources of ignition and to minimise the possibility of accidental damage.

4.6

Fixed dedicated loading / unloading arms are recommended. If hoses are used for loading/unloading operations, they should be stainless steel or equivalent. Hoses shall be inspected and pressure tested on a regular basis. Records of inspection data and results shall be retained.

4.7

All tanks and pipeline connections must be clearly product identified.

4.8

It is recommended to install a closed sample system for Propylene Oxide samples, to minimise emissions.

4.9

Valves should be fitted as close as feasible to the tank. Unused outlets should be blanked off.

5 Pumps

5.1

Pumps should be located outside tank bunds, on an impervious base, in an open space, and not in walled or confined spaces.

5.2

Centrifugal pumps with enclosed impellers and mechanical seals or canned motor pumps are most widely used in Propylene Oxide service.

5.3

Pumps should be constructed of ductile steel, or stainless steel.

5.4

Electrical pump motors shall be of ex proof design.

5.5

If pumps are remotely controlled then stop buttons shall be provided at the pump and at the remote control centre.

5.6

Pumps should be process controlled, e.g., by flow metering.

5.7

It should be noted that if centrifugal pumps are used, flow under gravity might occur when the pump is stopped.

6 Electrical considerations

6.1

The selection, installation and maintenance of electrical equipment for use in hazardous areas should be according to national regulations.

6.2

Pumps, tanks, electrical motors, pipelines, and all parts of the system must be effectively earthed to prevent the accumulation of static electrical charges. A compliance program shall be in place.

6.3

Working areas, i.e. tank stairs, platforms, loading/unloading facilities should be adequately illuminated for emergency response and security reasons.

7 Fire fighting considerations

7.1

A contingency plan shall be in place and tested in practice on a regular basis, at least once per year.

7.2

It is recommended to install sprinkler water at tanks and pumps, preferably triggered by an automatic gas detection system.

8 Systems for gas detection and monitoring

8.1

Depending on the storage volume, the storage area, the transfer pump area, gas detection and/or gas monitoring systems should be considered with audible, visible and remote alarms.

9 Measures to prevent contamination of storage tanks

A particularly high safety standard is necessary to provide protection against products that react with Propylene Oxide or products that are able to catalyse reactions.

9.1

Two redundant and quick shut-off valves to prevent backflow from the production plant should be installed. This equipment must be very reliable.

9.2

Measures to prevent contamination via the nitrogen system (see Customer checklist).

9.3

Measures to prevent contamination via the vent gas.

Appendix 10 Member Companies of the Propylene Oxide / Propylene Glycols Sector Group

MEMBER COMPANIES	
BASF SE	Germany
DOW Deutschland Anlagengesellschaft GmbH	Germany
INEOS	Germany
LYONDELLBASELL INDUSTRIES	the Netherlands
REPSOL QUIMICA	Spain
SHELL CHEMICALS EUROPE	the Netherlands
BAYER MATERIALSCIENCE	Germany

Appendix 11 Glossary of abbreviations

ADR	Accord européen relatif au transport des marchandises dangereuses par route. European agreement concerning the international carriage of dangerous goods by road.
ADN	Accord européen relatif au transport des marchandises dangereuses par voie de navigation intérieure. Regulations concerning the transport of dangerous substances in barges on inland waterways.
ADNR	See ADN: R for Rhine
ASME	American Society of Mechanical Engineers
BL	Bulk liquid
CAS	Chemical Abstract System
CDI	Chemical Distribution Institute
Cefic	Conseil Européen de L'Industrie Chimique
DIN	German Industry Standard (Deutsche Industrie Norm)
DOT	Department of Transportation
EEC	European Economic Community
EINECS	European Inventory of Existing Commercial Chemical Substances
Ems	Emergency procedures of ships carrying dangerous goods
ERG Code	Emergency Response Drill Code
IARC	International Agency for Research on Cancer
IATA	International Air transport Association
IBC	Intermediate Bulk Container
IBC Code	International code for the Construction and equipment of ships carrying dangerous chemicals in bulk
ICAO	International Civil Aviation Organization
ICE	International Chemical Environment (Cefic)
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
ISO	International Standard Organization.
JSA	Job Safety Analysis
LC50	Lethal Concentration (50%)

LD50	Lethal Dose (50%)
LG	Liquefied Gas
MAC	Maximum Acceptable Concentration
MARPOL	Marine Pollution Act
MFAG	Medical First Aid Guide for use in accidents involving dangerous goods at sea
MITI	Ministry of International Trade and Industry (Japan)
N.A.	Not Applicable
OSHA	Occupational Safety and Health Administration (USA)
PTFE	Polytetrafluorethylene
RID	Règlement International concernant le transport de marchandises dangereuses par chemin de fer. Regulations concerning the international carriage of dangerous goods by rail.
RTC	Rail Tank Car
RTECS	Registry of Toxic Effects of Chemical Substances
SOLAS	Safety of Life at Sea
SQAS	Safety and Quality Assessment System (Cefic)
STEL	Short Term Exposure Limit
Tremcard	Transport Emergency Card (ADR)
TLV	Threshold Limit Value
TWA	Time Weight Average
UN	United Nations

Appendix 12 Recommended general instructions for Propylene Oxide drivers

Propylene Oxide (PO) is flammable and chemically reactive, having harmful properties as to health and to the environment. Nevertheless, it can be handled, transported and stored in a safe way, provided that appropriate precautions are observed.

The Propylene Oxide driver has an important job to do. He is accompanying the shipment and is, during the entire transport, in charge of the technical care of his vehicle and the product. It is essential that the driver is totally familiar with the nature of the potential hazards which may be presented by Propylene Oxide during transport, and the action to be taken in the event of an emergency.

These recommended general instructions for Propylene Oxide drivers have been prepared by the Propylene Oxide Distribution Working Group of Cefic.

The objective in preparing a uniform set of instructions for drivers is to ensure that Propylene Oxide is handled and transported in a safe manner.

It should be noted that individual Propylene Oxide producers may stipulate additional requirements where they see fit for safe transport.

Before drivers are permitted to convey Propylene Oxide they must be in possession of a valid ADR driver's certificate, dangerous goods, class 3 for international transport, or an equivalent document.

Drivers who have successfully completed Propylene Oxide training and associated test will receive a company issued Propylene Oxide training certificate.
The Training Certificate is mutually accepted by all Propylene Oxide producing companies affiliated to Cefic.

Topics that will be covered as part of the driver training are:

1. Product Information (as per Chapter 2)
2. Health hazards (as per Chapter 2)
3. Personal Safety Equipment (as per Chapter 5)
4. Loading/unloading (as per Chapter 3.1 and 3.5 and relevant sections of appendix 3 and 5)
5. Transportation (as per Chapter 3.2)
6. Emergency Procedure (as per Chapter 6)

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