FOREWORD

The first edition of the “Emergency Response Manual for Transport of TDI and MDI”, dated February 1992, has been thoroughly reviewed. The intention was to update information related to the declassification of MDI for transport and to incorporate the changes to the Mutual Aid Emergency Response System as agreed between the ISOPA members companies.
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* UNDER REVIEW *
1. PURPOSE

This manual has been prepared by ISOPA, the European Isocyanate and Polyol Producers Association, an affiliated organisation of CEFIC. It is designed to augment and strengthen existing National and Company communication systems when dealing with TDI and MDI. It describes a mutual aid scheme whereby ISOPA companies have undertaken to respond as necessary on each other’s behalf in order to ensure that expert assistance is available as quickly as possible at the scene of a transport emergency involving TDI or MDI.

2. ADOPTION

All ISOPA member companies have signed the convention for providing mutual aid in the case of incidents during the transport of TDI and MDI.

ISOPA will review and update this document every four years or whenever there are major changes or new experience or knowledge becomes available, whichever occurs first.

ISOPA recommends that all parties who may be involved in an incident in the transport and distribution of Diisocyanates, consider to adopt these guidelines.

3. PRODUCTS

Toluene Diisocyanate (TDI) is classified and regulated as hazardous for handling and transport. The “UN Sub-committee of Experts on Transport of Dangerous Goods” decided in July 1994 to remove Diphenylmethane Diisocyanate (MDI) from the list of hazardous goods.

However, MDI continues, quite properly, to be regulated in EU countries as hazardous material in handling and usage. For this reason it has been decided to continue to maintain MDI in the Emergency Response System.

To avoid the need for repeated explanations in this document, wherever MDI is referred to as a dangerous good for transportation it should be understood in this sense.

Properties, hazards and safety information for TDI and MDI is attached (see Annex 1).
4. INTERPRETATION CAVEAT

Many of the national authorities in Europe have developed communication systems for dealing with chemical transport emergencies, which rely upon assistance being provided by chemical companies. Some chemical companies have also developed Company emergency response procedures (see Annex 7).

The prime responsibility for dealing with transport emergencies involving chemical and particularly dangerous goods rests with the national emergency services in the country concerned. Nevertheless, emergency services in many European countries recognise that the chemical industry can provide a vital supporting role and therefore seek their expert advice and assistance on safe methods of handling, recovery and disposal of chemicals involved in transport emergencies. The chemical company contacted for advice or assistance may be the manufacturer, supplier, importer or user of the chemicals, or may be selected for other reasons, for example, proximity to the scene of the emergency.

The ISOPA mutual aid scheme can be activated on its own or can complement the ICE scheme (see Annexes 2 and 7).

It is the individual responsibility of users of this manual to evaluate and apply it while fully taking into account all specific circumstances and their own situation.

This manual does not replace the Tremcard for TDI or any instruction in writing for MDI established by the consignor of this product. This document is a supplement to the information given by the Tremcard or the consignor’s Information Sheet for drivers.

The instruction given by the Tremcard or by the consignor’s Information Sheet for drivers must always be followed as the initial course of action, which includes the information needed to contact the supplier.

No part of this manual should be used or interpreted in a way which would conflict with existing international and/or national legislation, including competition law. In any case, applicable legal provision will always take precedence over any part of this manual.
The European Isocyanate and Polyol producers who are members of ISOPA have established a system of mutual aid to deal with potential emergencies arising during the transportation of Toluene Diisocyanate, Diphenylmethane Diisocyanate or their derivatives in Europe.

The principles of the resulting “Convention for providing mutual aid in the case of incidents during the transport of TDI or MDI” are as follows:

a) In the event of any difficulty occurring during transportation of a shipment of either TDI (UN- Number 2078) or MDI or their derivatives forwarded by one of the participating COMPANIES, such difficulty, in the supplier’s opinion, having the possibility to cause damage to persons, property or the environment or preventing the safe continuation of transportation, then the said COMPANY may request another COMPANY closer to the scene of the incident to intervene.

b) In this context, “transportation” is taken to mean all of the activities associated with the transport unit, including unloading.

c) All COMPANIES will promptly respond to a request from another COMPANY which considers that there is a need for technical advice or assistance at the scene of the incident.

d) The request for any intervention at the scene of the incident may be made by telephone but must be confirmed in writing by fax.

e) Each of the COMPANIES may be requested to provide assistance from an appropriate Emergency Response Centre. The contact numbers are listed in Annex 8.

f) The COMPANIES undertake to assist each other as far as is possible. The role of the intervening COMPANIES is to provide technical advice to the Emergency Authorities on the nature of the product and on the measures necessary to deal with the incident, and to provide technical assistance if requested by the Emergency Authorities.

g) A company which has asked another COMPANY to send staff to the scene of an incident remains responsible for the support given to the Authorities. The intervening COMPANY acts on behalf of the requesting COMPANY until a representative of the latter reaches the scene or until advised by the requesting COMPANY that they may withdraw.

h) The intervening COMPANY will use its best efforts to keep the requesting COMPANY informed of progress.
i) If asked by the requesting COMPANY, the intervening COMPANY and their equipment should be prepared to stay at the scene unless otherwise agreed between the requesting COMPANY and the intervening COMPANY. In any incident, where the Emergency Authorities are not involved, the intervention will be restricted to limiting any danger and to stabilising the situation pending arrival at the scene of a representative of the requesting COMPANY.

j) If the Emergency Authorities in any country call for assistance from a company under the provisions of a formally binding national scheme, then the provisions of that scheme will be paramount. In such circumstances, the intervening COMPANY shall promptly advise the requesting COMPANY.

k) In the event of “force majeure” the obligations of the Convention are removed but the intervening COMPANY should inform the requesting COMPANY of the event of the “force majeure” as soon as possible. For the purpose of this clause “force majeure” means any cause beyond the reasonable control of the intervening COMPANY.

l) In the case of intervention the intervening COMPANY will be reimbursed as soon as possible by the requesting COMPANY for all expenses so incurred during working and travelling from the location of the intervening COMPANY.

m) The intervening COMPANY shall have no liability or responsibility for any damages suffered by the requesting COMPANY or a third party, and the requesting COMPANY shall indemnify the intervening COMPANY accordingly.

n) Each member company takes on responsibility, within a designated territory, for organising the Diisocyanate emergency response provided for in the ISOPA ER Convention. The COMPANY establishes a focal point location for its respective territory, a 24 hr manned English response emergency centre phone and fax number, and appoints an emergency centre manager.

o) The Mutual Aid Scheme is being integrated with the ICE scheme (see Annex 2), but it can also be activated as a stand-alone product mutual aid scheme.
1. INTRODUCTION

The initial advice of the existence of a transport emergency or transport incident involving either TDI or MDI will normally be made by the driver of the transport unit. This will usually be as a result of a telephone call to the local police who will then contact the fire brigade and the legally responsible authorities. If the driver is unable to contact the emergency services, the initial advice may well be received from a member of the public.

It is recognised that the public emergency services may act in one of two ways. Either they may initiate a national transport emergency system which may rely upon the provision of expert advice concerning TDI and MDI from a nominated chemical Company within the system, or they may decide to contact the supplier, whose name and address appears on the consignment notes. In the latter case, the supplier is then able to initiate, if appropriate, the ISOPA Mutual Aid Scheme for assistance in dealing with transport emergencies, as described in Section 2. National schemes may not respond to MDI incidents since it has been declassified.

2. LEVEL OF ACTIVITY

It is envisaged that three possible levels of professional assistance could be made available. These are:

- Level 1 Advice by telephone
- Level 2 Advice by experts at the scene of the incident
- Level 3 Active help and provision of equipment at the scene of the incident
3. INITIATING THE MUTUAL AID SCHEME

In the event of an ISOPA member COMPANY requesting intervention by another ISOPA member, the following procedures shall apply:

a) the request for intervention shall be made by the most efficient communication.

b) the request for intervention shall subsequently be rapidly confirmed in writing by a fax with heading “ISOPA MUTUAL AID SYSTEM/RUSH TO DESK”.

4. REQUIREMENTS OF THE INTERVENING COMPANIES

a) Each intervening Company in the Mutual Aid Scheme should provide persons capable of advising on how to deal with an MDI or TDI incident.

b) All assistance will be available 24 hours a day throughout the year unless indicated otherwise.

c) It is the responsibility of all Companies to notify the other Companies of any changes in telephone and fax numbers of their focal point. A current list of their locations, with telephone numbers, is shown in Annex 8.

d) All intervening Companies shall ensure that adequate training is given to staff who may be required to attend MDI and TDI transport incidents.

e) Appropriate equipment for dealing with MDI and TDI transport emergencies for level 3 response (see Annex 3) should be provided by and be available at all intervening Companies (own or contractor equipment).

f) The responsibility for dealing with the media rests with the requesting Company. Intervention teams should, in principle, not comment to the media regarding product specific information, but should instead refer them to the Company media expert of the requesting Company.
Any incident will be a unique situation and it is not possible to write guidelines to cover all eventualities. However, in order to provide the most effective response and minimise the impact of an incident, it is essential to have some procedures established to enable the best course of action to be speedily determined.

In transport, TDI is classified as toxic and MDI is unclassified and thus non hazardous. In the EC classification system, for practical purposes TDI is toxic and MDI harmful. The major concerns in any incident are to contain any spillage and to evacuate non-essential personnel and the general public from the area, making sure they are located up wind of the incident location.

There may be language difficulties in certain circumstances and where this applies communications should preferably be in English.

- Name, status and telephone number of the person reporting the incident.
- Location of incident - Description of area (populated area?).
- Have the emergency authorities been notified?
- Is the driver in attendance and providing or capable of providing assistance?
- Is anyone injured?
- Is it a bulk road vehicle, ISOtank, rail tank car or an IBC or drum?
- Are there any signs of product leakage and, if so, from where?
- Is there a risk of pollution?
- If it is a bulk consignment, is the vehicle placarded - what are the details (i.e. numbers on the orange plate)?
- If in IBCs or drums, what details have been noted from the labels?
- What is the name of the Company/haulier involved - registration number of vehicle/tank?
- Is the bulk tank or package(s) upright?
- Any other relevant information - current status of the incident.

1. RECORDING OF INFORMATION/ USE OF A CALL SHEET

The initial communication could come from a variety of sources including a member of the public. In order to ensure details of the incidents are rapidly established in a clear and logical manner, the use of a “call sheet” is recommended which should include the following (a typical example is given in Annex 5):
2. ADVICE BY TELEPHONE – LEVEL 1 RESPONSE

The prime sources of information as to how to respond to an incident will be the information in writing as given to the driver for MDI, Tremcard for TDI and/or the Safety Data Sheets which detail the properties and hazards of TDI and MDI (see Annex 1a).

The advice given will be dependent upon the severity of the incident and the current status at the time of notification. It will also depend upon whether the emergency authorities have been notified, their expected arrival time, or whether they are actually present on site. If the incident has occurred on company premises then the appropriate fire or safety personnel should be informed.

A product expert within the company receiving the incident notification should be advised and asked to stand by in case further clarification of the products properties and hazards is required.

It is important to stress the following at an early stage:

- Always wear personal protective equipment.
- Do not breathe fumes or vapour.
- If possible without personal risk, try to prevent contamination of soil and water.
- Evacuate the area ensuring personnel and the public are up wind of the site.
- If in a confined space, ventilate contaminated area thoroughly.
- Contain or cover spillage.

Once this initial advice has been given, if it has not already been done, the emergency authorities should be notified if the incident has occurred in a public place.

3. ADVICE BY EXPERTS AT THE SCENE – LEVEL 2 RESPONSE

The provision of either product, transport or fire and safety responders from a company will usually be at the request of the emergency authorities. This may also occur if the incident happened on company premises and further assistance than level 1 - advice by telephone - is required. At an incident where the emergency authorities are present they are in charge of the incident. It is in this context that the company expert(s) in attendance should place themselves at their disposal and any actions undertaken should be at the instruction of emergency authorities.

Under no circumstances should bulk tanks, or drums or any other packaging, that have been subject to a transport incident, be inspected by any person not
wearing the personal protective equipment, as specified in the Annex 3 - section 1.1, for the product involved.

4.1 ASSESSMENT – NO VISIBLE DAMAGE

If there is no visible damage to a bulk road vehicle, rail tank car or ISO tank, a suitably qualified engineer should be called to confirm the equipment is safe to continue to be used. If possible an engineer from the company providing the transport equipment should be called to verify this. In any event shipment should not recommence until the carrier or their appointed agent has agreed that it is safe to do so.

For intermediate bulk containers (IBC) careful inspection should be made of discharge valves, pressure relief valves where fitted, lids, loading points and seams. If there is no visible damage to these components, and the pallet is still serviceable, the container can be used for the continuation of shipment.

The seams and bungs of steel drums should be carefully examined. If there is no product seepage they can continue in transit if loaded vertically and secured.

4.2 ASSESSMENT – DAMAGED AND/OR LEAKING TANKS OR CONTAINERS

In these circumstances it is essential that precautions already outlined are strictly adhered to, notably:

- Taking instruction from the emergency authorities and incident “controller”.
- Ensuring the area is evacuated and nonessential personnel are up wind.
- The wearing of personal protective equipment specified for the product.

**Containment**

Any spillage should be contained as quickly as possible. Bunds to restrict the area may be made of sand, earth or other containment material. Shallow containers may be used to collect any product still being discharged.

Try to prevent the product from contaminating soil and water and entering any drainage systems and watercourses. Diisocyanates will react with water and form insoluble polyureas thus blocking drainage systems. If material enters drainage systems it should be pumped out into open vessels at the earliest possible stage.

Minor punctures may be sealed by the use of wedges, gaskets, cushions of resistant materials, notably wood, PTFE or neoprene rubber.
For bulk transport units, assessment of the location of leakage, its severity and effectiveness of any sealant method will determine whether, and how quickly, a replacement tank car will be required for the material to be transferred to it by pump.

For packed products, the leakage may be contained by sealing and/or placing the container in a position where the puncture is uppermost to prevent product loss. Replacement IBCs, new drums or oversized drums should be provided for leaking packages.

Once contained, and, where appropriate, the product has been safely transferred, all absorbent material and any decontaminants should be shovelled into open top drums. Drums should be removed to a site for safe disposal after the reaction is finished.

Neutralise the affected surfaces with liquid decontaminant and test the atmosphere for residual Diisocyanate vapour (see Annex 3 - sections 1.7 and 1.8). Re-establish the area as safe for the public or if in plant safe working conditions.

**4.3 ASSESSMENT – RISK OF FIRE OR ON FIRE**

Hazardous combustion products may include carbon monoxide, carbon dioxide, hydrogen cyanide, oxides of nitrogen and other toxic gases.

Full protective clothing and self-contained breathing apparatus is to be worn.

If the tank or container cannot be moved from the area in which the fire is located then a water screen (curtain) between the fire and tank/container should be used to minimise the heat effect on the tank or containers.

If a water screen cannot be safely enacted then direct water cooling of the tank or container’s surface should take place to prevent distortion of the metal and possible thermal decomposition of the Diisocyanate.

Where the tank or container(s) is on fire then dry chemical powder, carbon dioxide or protein-based foam can be used as an extinguishing media. If water has to be used to extinguish the fire it should only be sprayed in large quantities.

Any damage to the tank or container will allow entry of moisture, particularly if water has been used. In this case a reaction will take place with the Diisocyanate to form solid polyureas.

The formation of solid polyureas may seal the rupture in the tank or container.

The tank or drum or IBC may become pressurised by the build up of solid material and gases. In order to prevent serious risk of rupture through pressure, the tank or container must not be resealed.
If it can be conducted safely then the tank or container should be vented to prevent build up of pressure. All precautions outlined for containment of spillage, and decontamination of the site, as outlined in Section 4.3.2., should be followed during the operation.
1. BULGING PACKAGES

A bulging package of Diisocyanate is a result of contamination of the product, usually with water. The slow but continuous reaction with Diisocyanate produces carbon dioxide and pressure increase. It is necessary to relieve this pressure safely before the packaging bursts. This is best accomplished by puncturing the top of it with a long spike or grapnel. During this action all uninvolved personnel must be evacuated and kept away from the area, and working personnel must have complete chemical protection.

The punctured package must then be placed in a controlled area until the end of the reaction, before being returned to the supplier, as quickly as possible, for safe disposal. Prior to transport the perforated packaging has to be put in a oversize container fitted with a venting device. To make sure that no pressure build-up will occur venting in regular intervals is essential.

2. PACKAGES UNDER WATER

If an accident has led to containers falling into water, they should, if possible, be inspected for leaks. In the absence of leaks, the containers can simply be recovered, wiped dry and returned to the supplier. Depending on the situation, leaking packages can be sealed while still in the water or after being brought to land. In both cases the containers should be considered as potentially contaminated with the possibility of a pressure increase. (see 5.1)

3. PACKAGES WHICH HAVE FALLEN OVER AND BURST OPEN

Large surface areas contaminated by liquid Diisocyanate should be completely covered with dry sand or other mineral absorbers and the damaged packaging should be placed in an oversize drum. The personnel involved must wear protective clothing and breathing equipment.

The sand and any contaminated earth should be collected in open top drums for proper disposal. The drum lids must be capable of being vented in the case of any pressure increase. The site of the spill should then be thoroughly washed with a Diisocyanate decontaminating liquid (see Annex 3 - section 1.7).

Following a precautionary determination for any residual Diisocyanate in the air (see Annex 3 - section 1.8), the location can be considered decontaminated.

If the evaporation of TDI has to be diminished immediately, cover the spillage with extinguishing foam.
4. CHEMICAL REACTION BETWEEN DIISOCYANATE AND POLYOL-COMPONENTS AS A RESULT OF DAMAGE TO A SPLIT COMPARTMENT TANKER OR THE INCORRECT FILLING OF TANKS

The combination of Polyol and Diisocyanate components yields large amounts of heat and possible gas evolution. Once begun, this reaction is extremely difficult to stop. One goal must be to prevent bursting by means of controlled venting.

In storage, tanks releasing the combined material into the bund should be considered.

Although difficult to achieve with insulated tanks, cooling should be attempted. Any reaction vapours released should be knocked down with large amount of water spray or foam. The reaction should proceed to the end with a minimum of heat and vapour evolution. If contamination and consequent reaction and heating up are moderate, try cooling down avoiding, if possible, direct contact with water.

All personnel involved must wear complete protective equipment.

Because of the potential, large amounts of heated Diisocyanate vapours which can be involved, the evacuation of the immediate surroundings should be considered.
1. All ER Focal Points of ISOPA Members Companies undertake to ensure that these maintain a sufficient number of fully trained staff to deal with TDI and MDI transport emergencies. ISOPA members will appoint an Emergency Response Focal Point Manager. (Job Description see Annex 4). When preparing a training program for Emergency Response personnel, the following points should be considered:

a) the organisation, execution and evaluation of at least one full Emergency Response exercise per year: preferably a joint exercise with all ISOPA members

b) the analysis of all transportation incidents from own/other companies to learn from previous exercise

c) training/information on leak mending techniques

d) keeping in contact with other Emergency Response Teams to exchange knowledge and experience and report on incidents

e) information on existing National Transport Emergency Schemes to understand the approach in different national territories

f) practice in Emergency Response communication in English, to avoid communication difficulties at the scene of the incident; practice in reporting a transportation emergency

g) testing internal operative procedures aiming to provide most effective interventions and easiest co-ordination with National Transport Emergency Schemes and the requesting ISOPA Members Companies

h) basic knowledge of the legal aspects of dealing with a transport emergency

i) dealing with other parties at the scene of the incident - police, fire brigade, railway personnel, local authorities

j) knowledge of the product hazards on spills and leaks, also in combination with fire; first aid practices for Diisocyanates, knowledge of the MSDS contents, definitions etc.

k) knowledge of the personal protection basics for MDI and TDI and binding agents in case of liquid spills
2. The Member Companies agree to arrange Emergency Response exercises designed to deal with TDI and MDI transport emergencies, for the purpose of testing procedures, equipment, speed of response etc. Such Emergency Response exercises shall be organised at least once per year, to which all Member Companies will be invited to send at least one representative of the E.R. team. The Member Companies will take turns to organise these exercises on a rota basis. At these exercises the details of any significant previous incident in the period will be reported.

3. The Member Companies agree to share information (provided it is not sensitive under competition law) with other Members on all incidents and accidents in Distribution in order to learn from best practice in dealing with incidents and accidents with TDI and MDI.
## TDI

**Toluene-2,4-diisocyanate\(^{\text{84-9}}\)**

**Toluene-2,4/2,6-diisocyanate mixture\(^{\text{84-9}}\)**

### TYPICAL PHYSICAL AND CHEMICAL DATA

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>Appearance</td>
<td>Liquid</td>
</tr>
<tr>
<td>Colour</td>
<td>Colourless to pale yellow</td>
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<tr>
<td>Odour</td>
<td>Sharp, pungent</td>
</tr>
<tr>
<td>Specific gravity (EEC A3 method)</td>
<td>1.22 g/cm³ (at 20°C)</td>
</tr>
<tr>
<td>Viscosity</td>
<td>3 mPa s (at 25°C)</td>
</tr>
<tr>
<td>Vapour density</td>
<td>6 (air=1)</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>0.03 hPa (at 25°C)</td>
</tr>
<tr>
<td>Saturated vapour concentration</td>
<td>160 mg/m³ (at 25°C)</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Not soluble; reacts with water and generates CO₂</td>
</tr>
<tr>
<td>Boiling point (EEC A2 method)</td>
<td>Approx. 250°C (at 1013 hPa)</td>
</tr>
<tr>
<td>Freezing point 2, 4-TDI</td>
<td>22°C</td>
</tr>
<tr>
<td>2,4/2,6-TDI 80/20</td>
<td>10°C</td>
</tr>
<tr>
<td>2,4/2,6-TDI 65/35</td>
<td>6°C</td>
</tr>
<tr>
<td>Flash point (EEC A9 method)</td>
<td>132°C</td>
</tr>
<tr>
<td>Auto-ignition temperature (EEC A15 method)</td>
<td>&gt; 595°C</td>
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<tr>
<td>Explosion limits (2,4-TDI)</td>
<td>Lower: 0.9% v/v (118°C)</td>
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<tr>
<td></td>
<td>Upper: 9.5% v/v (150°C) - not explosive by the EEC A14 method</td>
</tr>
<tr>
<td>Thermal degradation</td>
<td>Above 250°C</td>
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<tr>
<td>Hazardous degradation products</td>
<td>CO, CO$_2$, NO$_x$, HCN and other toxic products</td>
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<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Hazardous reactions with</td>
<td>Water, alcohols, amines, acids, bases</td>
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**TRANSPORT CLASSIFICATION**

**United Nations**

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<thead>
<tr>
<th>UN Number</th>
<th>2078</th>
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<tbody>
<tr>
<td>Class</td>
<td>6.1</td>
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<tr>
<td>Packing group</td>
<td>II</td>
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<tr>
<td>Proper shipping name</td>
<td>Toluene diisocyanate</td>
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**Sea (IMDG-Code)**

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<th>UN number</th>
<th>2078</th>
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<tr>
<td>IMDG-Code page</td>
<td>6269</td>
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<tr>
<td>Packaging group</td>
<td>II</td>
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<tr>
<td>Label</td>
<td>Toxic (skull and crossbones)</td>
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<tr>
<td>Proper shipping name</td>
<td>Toluene diisocyanate</td>
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**Road/Rail (ADR/RID)**

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<tr>
<td>Item</td>
<td>19(b)</td>
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<tr>
<td>Packing group</td>
<td>II</td>
</tr>
<tr>
<td>Label</td>
<td>Toxic (skull and crossbones)</td>
</tr>
<tr>
<td>Proper shipping name</td>
<td>Toluene diisocyanate</td>
</tr>
</tbody>
</table>
Orange-coloured plate | 60
| 2078

TREMCARD No. (CEFIC) | 173

**Air (ICAO-TI)**

- **UN number**: 2078
- **Class**: 6.1
- **Packing group**: II
- **Label**: Toxic (skull and crossbones)
- **Proper shipping name**: Toluene diisocyanate

**REGULATORY INFORMATION - EC Supply labelling (67/548/EEC 25th adaptation)**

- **Label name**: Toluene diisocyanate
- **Symbol of danger**: Skull and crossbones
- **Indication of danger**: Very toxic, T+

<table>
<thead>
<tr>
<th>Risk phrases</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R26</td>
<td>Very toxic by inhalation.</td>
</tr>
<tr>
<td>R36/37/38</td>
<td>Irritating to eyes, respiratory system and skin.</td>
</tr>
<tr>
<td>R40</td>
<td>Possible risk of irreversible effects*.</td>
</tr>
<tr>
<td>R42/R43</td>
<td>May cause sensitisation by inhalation and skin contact.</td>
</tr>
<tr>
<td>R52/53</td>
<td>Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.</td>
</tr>
</tbody>
</table>

* Limited evidence of a carcinogenic effect. Agreed new proposed change not yet effective.

<table>
<thead>
<tr>
<th>Safety phrases</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S23</td>
<td>Do not breathe vapours.</td>
</tr>
<tr>
<td>S36/37</td>
<td>Wear suitable protective clothing and gloves.</td>
</tr>
<tr>
<td>S45</td>
<td>In case of accident or if you feel unwell, seek Medical advice</td>
</tr>
</tbody>
</table>
S61 Avoid release to the environment. Refer to special instructions/Safety data-sheets.

"Contains isocyanates. See information supplied by the manufacturer".
TDI is listed in Directive 96/82/EC on the control of major accidents hazards involving dangerous substances (see section 16).

**International inventory status**

<table>
<thead>
<tr>
<th>EINECS status</th>
<th>This substance is listed on the EINECS inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Regulations</td>
<td>Specific by country</td>
</tr>
</tbody>
</table>

**TOXICOLOGY/HEALTH HAZARD DATA**

**Short-term Exposure**

<table>
<thead>
<tr>
<th>Ingestion</th>
<th>Single dose oral toxicity is low LD50 (oral rat) &gt; 5000mg/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ingestion may cause irritation to the gastro-intestinal tract.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eye contact</th>
<th>May cause irritation and reversible corneal injury. Vapours may irritate eyes.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Skin contact</th>
<th>Derma LD 50 (rabbit) &gt; 9000 mg/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>According to human experience, the material may cause moderate irritation. Animal studies have shown that skin contact, as a result of exposure to diisocyanates, may play a role in respiratory sensitisation. This emphasises the need to ensure protective clothing and gloves are worn when handling diisocyanate products.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inhalation</th>
<th>LC50 (4 hours rat) : (aerosol and vapour) 100-360 mg/m3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vapour and aerosols can cause severe irritation of the respiratory tract with burning sensation to the nose and throat. High exposure can result in inflammation of lung tissue and fluid in the lungs. In hyper-reactive or hyper-sensitive people very low concentrations may lead to bronchoconstriction (asthmatic signs and symptoms). The onset of symptoms may be delayed for several hours after exposure.</td>
</tr>
</tbody>
</table>

**Repeated and Long-term Exposure**
Respiratory  May cause sensitisation by inhalation. Chronic exposure by inhalation may result in permanent decrease in lung function.

Skin  May cause sensitisation by skin contact.

Carcinogenicity  Long term inhalation studies (rat, mouse) reveal no indications of carcinogenic potential; intragastric intubation of high and toxic doses of TDI led to increased incidence of tumours. However since intra gastric intubation is not an occupational route of exposure, the inhalation study is of more biological relevance to man. Industrial experience in humans has not shown any link between TDI exposure and cancer development.

Reproductive toxicity  There is no observation or demonstration of adverse effects of TDI on reproduction. TDI has shown not to induce birth defects.

First Aid Procedures

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 facility. Exposed persons should be kept under medical observation for at least 48 hours because delayed effects may occur.

Skin  Remove contaminated clothing. Immediate washing after skin exposure is important. Wash skin with warm water using soap. An MDI study has demonstrated that a polyglycol-based skin cleanser or corn oil may be more effective than soap and water. This may also apply to TDI.

Eye  In case of contact with eyes, rinse immediately with plenty of water for not less than 10 minutes and seek medical advice.

Ingestion  DO NOT INDUCE VOMITING. Wash out the mouth with water; do not swallow. Obtain medical attention immediately.

Advice to physicians  TDI containing compositions are respiratory irritants and potential respiratory and skin sensitisers. Treatment is essentially symptomatic for primary irritation or bronchospasm.
Exposed persons should be kept under medical observation for at least 48 hours because delayed effects may occur.

### Ecology

**Degradation**

Reacted with water to form, predominantly insoluble polyurreas which are chemically and biologically inert. Conversion to soluble products, including toluene diamine, is only appreciable under well-dispersed, low concentration conditions more typical of laboratory tests than of environmental spillages. In air, the predominant degradation process is OH radical attack and is relatively rapid.

**Ecotoxicology**

Measured ecotoxicity is that of hydrolysed product, generally under conditions maximising production of soluble species. The observed ecotoxicity to fish, bacteria and invertebrates is low/slight and to worms and plants is very low. Harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.
**MDI**

**Products:**  
Monomeric MDI (M)  
Polymeric MDI, “PMDI” (P)

(M) Diphenylmethane-4,4’-diisocyanate - CAS No.: 101-68-8  
(P) Diphenylmethane diisocyanate, isomers and homologues - CAS No.: 9016-87-9

### TYPICAL PHYSICAL AND CHEMICAL DATA

<table>
<thead>
<tr>
<th>Property</th>
<th>Monomer (M)</th>
<th>Polyisocyanate (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Liquid above +38.5°C</td>
<td>Viscous liquid</td>
</tr>
<tr>
<td>Colour</td>
<td>White to pale yellow as a solid</td>
<td>Brown*</td>
</tr>
<tr>
<td>Odour</td>
<td>Slightly musty</td>
<td>Slightly musty</td>
</tr>
<tr>
<td>Specific gravity (EEC A3 method)</td>
<td>1.23 (at 20°C) 1.20 (at 50°C)</td>
<td>1.24 (at 20°C)*</td>
</tr>
<tr>
<td>Viscosity</td>
<td>4.7 mPa s (at 50°C)</td>
<td>100-2000 mPa s (at 25°C)*</td>
</tr>
<tr>
<td>Vapour density</td>
<td>8.5 (Air=1)</td>
<td>8.5 (Air=1)</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>Approx. 1x10^-4 hPa (at 45°C)</td>
<td>1x10^-5 hPa (at 25°C)</td>
</tr>
<tr>
<td>Saturated vapour concentration</td>
<td>1.5 mg/m³ (calc. at 45°C)</td>
<td>&lt; 0.15 mg/m³ (calc. at 25°C)</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Not soluble; reacts with water and generates CO₂</td>
<td>Not soluble; reacts with water and generates CO₂</td>
</tr>
<tr>
<td>Boiling point (EEC A2 method)</td>
<td>&gt; 300°C (at 1013hPa) decomposes/polymerises</td>
<td>&gt; 300°C (at 1013hPa) decomposes/polymerises</td>
</tr>
<tr>
<td>Freezing/melting point</td>
<td>41 ± 2°C</td>
<td>5°C; forms crystals below 10°C*</td>
</tr>
</tbody>
</table>

* UNDER REVIEW *
<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point (EEC A9 method)</td>
<td>(M): &gt; 200°C</td>
</tr>
<tr>
<td></td>
<td>(P): &gt; 200°C</td>
</tr>
<tr>
<td>Auto-ignition temperature (EEC A15 method)</td>
<td>(M): &gt; 600°C</td>
</tr>
<tr>
<td></td>
<td>(P): &gt; 600°C</td>
</tr>
<tr>
<td>Explosion limits (upper and lower)</td>
<td>(M): Not applicable</td>
</tr>
<tr>
<td></td>
<td>(P): Not applicable</td>
</tr>
<tr>
<td>Thermal degradation</td>
<td>(M): &gt; 230°C</td>
</tr>
<tr>
<td></td>
<td>(P): &gt; 230°C</td>
</tr>
<tr>
<td>Hazardous degradation products</td>
<td>CO, CO₂, NOₓ, HCN and other products</td>
</tr>
<tr>
<td>Hazardous reactions with</td>
<td>Water, alcohols, amines, acids, bases</td>
</tr>
<tr>
<td>*To be specified by producer</td>
<td></td>
</tr>
</tbody>
</table>

**MDI**

The changes for MDI relate both to 4-4’MDI and other MDI based materials. Classification remains the same but an additional risk phrase R43 has been added.

**Label name: Diphenylmethane diisocyanate, isomers and homologues**

| Symbol of danger                              | St. Andrew’s Cross                 |
| Identification of danger                      | Xn                                 |
| Risk phrases                                  | R20 Harmful by inhalation.         |
|                                              | R36/37/38 Irritating to eyes, respiratory system and skin. |
|                                              | R42/43 May cause sensitisation by inhalation and skin contact. |
| Safety phrases                                | S23 Do not breathe vapours.        |
|                                              | S36/37 Wear suitable protective clothing and gloves.* |
|                                              | S45 In case of accident, or if you feel unwell, seek medical advice immediately (show the label where possible). |

*To be specified by producer

**TOXICOLOGY/HEALTH HAZARD DATA**
Short-term Exposure

Ingestion

Single dose oral toxicity is low LD50 (oral rat) : > 5000 mg/Kg (PMDI). Ingestion may cause irritation to the gastro-intestinal tract.

Eye contact

May cause slight to moderate irritation and reversible corneal injury.

Skin contact

Dermal LD 50 (rabbit) > 9000 mg/Kg
According to human experience, the material may cause moderate irritation. Animal studies have shown that skin contact, as a result of exposure to diisocyanates, may play a role in respiratory sensitisation. This emphasises the need to ensure protective clothing and gloves are worn when handling diisocyanate products.

Inhalation

LC50 (4 hours rat) ca 490 mg/m³ : using experimentally produced respirable aerosol having aerodynamic diameter <5 microns. Vapour and aerosols can cause severe irritation of the respiratory tract with burning sensation to the nose and throat. High exposure can result in inflammation of lung tissue and fluid in the lungs. In hyper-reactive or hypersensitive people very low concentrations may lead to bronchoconstriction (asthmatic signs and symptoms). The onset of symptoms may be delayed for several hours after exposure.

Repeated and Long-term Exposure

Respiratory

May cause sensitisation by inhalation. Chronic exposure by inhalation may result in permanent decrease in lung function.

Skin

May cause sensitisation by skin contact.

Carcinogenicity

Rats have been exposed for two years to an experimentally produced respirable aerosol of polymeric MDI which resulted in chronic pulmonary irritation at high concentrations. The prolonged irritation led to the formation of tumours in the lungs of a small proportion of the rats exposed to 6 mg/m². There were no tumours at 1 mg/m² and no effects at 0.2 mg/m². In the absence of prolonged high exposure leading to chronic irritation and lung damage it is highly unlikely that tumours could occur, although these results reinforce the need to observe the recommended safety precautions and occupational exposure limit when working with MDI.

Industrial experience in humans has not shown any link between MDI exposure and cancer development.
Reproductive toxicity

No birth defects were seen in two independent animal (rat) studies. Fetotoxicity was observed at doses that were extremely toxic (including lethal) to the mother. Fetotoxicity was not observed at doses that were not maternally toxic. The doses used in these studies were maximal, respirable concentrations, which are well in excess of defined occupational exposure limits.

First Aid Procedures

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 facility. Exposed persons should be kept under medical observation for at least 48 hours because delayed effects may occur.

Eye contact

In case of contact with eyes, rinse immediately with plenty of water for not less than 10 minutes and seek medical advice.

Skin contact

Remove contaminated clothing. Immediate washing after skin exposure is important. Wash skin with warm water using soap. An MDI study has demonstrated that a polyglycol-based skin cleanser or corn oil may be more effective than soap and water.

Ingestion

DO NOT INDUCE VOMITING. Wash out the mouth with water; do not swallow. Obtain medical attention immediately.

Ecology

Degradation

Reacts readily with water to form, predominantly, insoluble polyureas which are chemically and biologically inert. Conversion to soluble products, including diaminodiphenylmethane (MDA), is very low under the optimal laboratory test conditions of good dispersion and low concentration. In air, the predominant degradation process is predicted to be a relatively rapid OH radical attack, by calculation and by analogy with related diisocyanates.

Ecotoxicology

The measured ecotoxicity is that of the hydrolised product, generally under conditions maximising production of soluble species. Even so, the observe ecotoxicity to fish, bacteria and invertebrates is low/very low (LC50 > 100 mg/l) and to worms and plants is very low (LC/EC50 >=1.000 mg/l).
A pond study showed gross contamination caused no significant toxic effects on a wide variety of flora in all trophic levels (including fish), no detectable diaminodiphenylmethane (MDA), and no evidence of bioaccumulation of MDI or MDA.

Transport classification

Not classified as dangerous for transport. During the course of product training for drivers, it should always be remembered to take the most recent SDS sheet into account.
<table>
<thead>
<tr>
<th>COMPANY</th>
<th>MDI</th>
<th>TDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>* HUNTSMAN</td>
<td>I-BOND</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SUPRASEC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RUBINATE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>PERSTORP</td>
<td>SCURANATE</td>
<td>**</td>
</tr>
<tr>
<td>BORSODCHEM</td>
<td>ONGRONAT</td>
<td>ONGRONAT</td>
</tr>
<tr>
<td>DOW</td>
<td>VORANATE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISONATE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VORANATE - M</td>
<td>VORANATE - T 80</td>
</tr>
<tr>
<td></td>
<td>ISONATE - M</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAPI</td>
<td></td>
</tr>
<tr>
<td>BAYER</td>
<td>DESMODUR</td>
<td>DESMODUR - T</td>
</tr>
<tr>
<td>ELASTOGRAN</td>
<td>LUPRANATE M</td>
<td>LUPRANATE T</td>
</tr>
<tr>
<td></td>
<td>LUPRANAT VP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISOXXX/Y</td>
<td>ISOXXX/Y</td>
</tr>
<tr>
<td>BASF</td>
<td>BASONAT P</td>
<td></td>
</tr>
<tr>
<td>SHELL</td>
<td></td>
<td>CARADATE</td>
</tr>
</tbody>
</table>

* Update 2009
Annex 1c

Information for drivers
Applies only during road transport

CARGO

4,4’-DIPHENYLMETHANE DIISOCYANATE (MDI) BASED COMPOSITIONS

- Immiscible with water, heavier than water.

IMMEDIATE ACTION BY DRIVER:
NOTIFY POLICE AND FIRE BRIGADE

- If possible move the vehicle to open ground.
- Stop the engine.
- No naked lights. No smoking.
- Mark roads and warn other road users.
- Keep public away from danger area.
- Keep upwind.

NATURE OF HAZARD

- Harmful by inhalation, may cause sensitisation by inhalation.
- The substance has irritant effect on eyes, skin and air passages.
- Decomposes in a fire, giving off noxious and toxic fumes.
- Reaction with water produces heat and CO₂.
- Heating of containers will cause pressure rise with risk of bursting.

BASIC PERSONAL PROTECTION

- Suitable respiratory protective device.
- Goggles giving complete protection to eyes.
- Plastic or rubber gloves, apron and boots.
- Eyewash bottle with clean water.

SPILLAGE

- Shut off leaks if without risk.
- Prevent liquid entering sewers; heavier than water.
- Contain and cover spillage with sand or earth and consult an expert.
• If substance has entered a water course or sewer or contaminated soil or vegetation, advise police.

FIRE

• The material is not particularly flammable, but will burn if involved in a fire.
• Keep container(s) cool by spraying with water if exposed to fire.
• Extinguish preferably with dry chemical, sand, foam or water in large quantities.

FIRST AID

• If the substance has got into the eyes, immediately wash out with plenty of water and seek medical advice.
• Immediately remove contaminated clothing and wash affected skin with plenty of water followed by soap and water.
• Seek medical treatment when anyone has symptoms, which might occur immediately or after several hours, due to inhalation or contact with skin or eyes or swallowing.
  Show this information sheet.
• Due to delayed effect of poisoning, persons who have inhaled the vapour or the fumes produced in a fire or been in contact with the substance, must lie down and rest.
  Patient should be kept under medical observation for at least 48 hours.
CARGO

TOLUENE DIISOCYANATE (TDI)

- Colourless to yellowish liquid with perceptible odour.
- Solidifies at 6°C-21°C.
- Immiscible with water, heavier than water.

IMMEDIATE ACTION BY DRIVER:
NOTIFY POLICE AND FIRE BRIGADE

- If possible move the vehicle to open ground.
- Stop the engine.
- No naked lights. No smoking.
- Mark roads and warn other road users.
- Keep public away from danger area.
- Keep upwind.

NATURE OF HAZARD

- Toxic.
- The substance poisons by inhalation or ingestion.
- Irritant effect on eyes, skin and air passages.
- Decomposes in a fire produces toxic fumes. Symptoms may develop after several hours.
- Heating will cause pressure rise with risk of bursting.
- Contact with water produces carbon dioxide.
- May cause sensitisation to skin and air passages.

BASIC PERSONAL PROTECTION

- Suitable respiratory protective device.
- Goggles giving complete protection to eyes.
- Plastic or synthetic rubber gloves, apron and other light protective clothing and boots.
- Eyewash bottle with clean water.
SPILLAGE

- Shut off leaks if without risk.
- Prevent liquid entering sewers, basements and workpits. Vapour may create toxic atmosphere.
- Contain or absorb leaking liquid with sand or earth or other suitable material. Consult an expert.
- Do not use water jet on a leak of the tank.
- If substance has entered a water course o sewer or contaminated soil or vegetation, advice police.

FIRE

- Keep container(s) cool by spraying with water if exposed to fire; beware dangerous reaction with water if container(s) ruptured.
- Extinguish preferably with waterspray, foam or dry chemical.

FIRST AID

- If the substance has got into the eyes, immediately wash out with plenty of water. Continue treatment until medical assistance is provided.
- Remove contaminated clothing immediately and wash affected skin with soap and water.
- Do not induce vomiting.
- Persons who have been in contact with the substance or who have inhaled its vapour or the fumes produced in a fire may not show immediate symptoms. They should be taken to a doctor with this card. The patient should be kept under medical observation for at least 48 hours.
Annex 2

Technical help and information

WITHOUT ICE EMERGENCY RESPONSE (ISOPA MUTUAL AID)

ICE EMERGENCY RESPONSE ER / ISOPA

MDI/TDI Accident
In Country B
Producer is located in Country A

ICE National Response Center
In Country B

MDI/TDI PRODUCER
In Country A

UNDER REVIEW

Recommended equipment for dealing with MDI or TDI transport emergencies

Individual companies should ensure that sufficient emergency equipment is readily available and that connection sizes, etc, are compatible with local operating conditions. The following list of equipment is recommended:

1 GENERAL EQUIPMENT

1.1 PERSONAL PROTECTIVE EQUIPMENT
- Overalls
- Goggles
- Impervious gauntlet gloves
- Full mask respirator with AB-filter
- Steel toed rubber safety boots
- Self-contained breathing apparatus
- Safety helmet

1.2 LEAK SEALING MATERIAL
- Wedges in different sizes and resistant material e.g. PTFE, wood, lead and braided lead, bandages made of neoprene rubber.
- Set of gaskets, cushions and bandages fitted with straps.
- Open shallow containers made of stainless steel or polypropylene (depth about 15-20 cm) which are used to collect leaking material.

1.3 ABSORBANTS
- Mineral agent
- Sand
- Oilsorb
- Vermiculite

1.4 IF THE SPILLAGE CANNOT BE CONTROLLED, TRANSFER TDI OR MDI BY PUMPING
Pump unit:
- membrane pump, explosion proofed, self priming
- peristaltic pump for pumping highly viscous fluids, explosion proof and self priming
- resistant hoses, metal hoses with all types of connections
- fittings for the most common European tanker connections

All equipment must be clean and ready for use.
1.5 STANDARD FITTINGS/COUPLINGS

a) **Tank cars**
   - English coupling Guillemin 3” to the German system TW (Tankwagen) MK50 (mm)
   - Flange coupling DN 80 (mm) to TW MK50 (mm)
   - TW VK 80 to TW MK 50
   - MIL-C-27487 AMK3” to TW MK 50
   (TW MK 50 is the female connection to the tank car)

b) **Rail tank car**
   - 5 1/2” Withworth to TW MK 50

c) **Eurotank**
   - Road container R3” to TW MK 50
   - IBC container (content 1m³)
     - S 59 x 4 1/2” to TW MK 50
     (S means it cuts its own thread)

d) It is also useful to have a universal adapter or reducer of the type supplied by Elaflex. It is used in cases where a coupling does not fit or has been damaged or stuck. Order number KWK - MK 80.

e) A valve should be available which fits to TW MK50 for the purpose of closing the connection.

f) All sealings should be made of compatible material.

1.6 COMPLETE FIRE FIGHTING EQUIPMENT INCLUDING DRY POWDER AND FOAM EXTINGUISHERS

1.7 DECONTAMINATING LIQUIDS

<table>
<thead>
<tr>
<th>Formulation 1</th>
<th>Weight or volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>90 - 95%</td>
</tr>
<tr>
<td>Sodium carbonate</td>
<td>5 - 10%</td>
</tr>
<tr>
<td>Liquid detergent</td>
<td>0.2 - 2%</td>
</tr>
</tbody>
</table>
Formulation 2                                      Weight or volume

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>90 - 95%</td>
</tr>
<tr>
<td>Concentrated ammonia*</td>
<td>3 - 8%</td>
</tr>
<tr>
<td>Solution</td>
<td></td>
</tr>
<tr>
<td>Liquid detergent</td>
<td>0.2 - 2%</td>
</tr>
</tbody>
</table>

* Care should be taken with ammonia since it is corrosive and hazardous to health and aquatic organisms.

For routine operations e.g. decontamination of protective equipment tools and parts, the following formulation 3 is more effective. The solution is flammable and should be handled accordingly.

Formulation 3                                      Weight or volume

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>An alcohol (ethanol, isopropanol or butanol)</td>
<td>50%</td>
</tr>
<tr>
<td>Water</td>
<td>45%</td>
</tr>
<tr>
<td>Concentrated ammonia</td>
<td>5%</td>
</tr>
<tr>
<td>Solution</td>
<td></td>
</tr>
</tbody>
</table>

Note: Formulations 1-3 are not suitable for skin decontamination.

Formulation 4

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water with 1% surfactant.</td>
</tr>
<tr>
<td>Decontamination for skin only.</td>
</tr>
</tbody>
</table>

RECOMMENDED METHODS FOR DECONTAMINATION

For formulation 1 and 2, the diisocyanate will be added slowly and under stirring to the liquid decontaminent (and not vice-versa) in an open-top drum or container. As heat and carbon dioxide gas evolve while the diisocyanates reacts, the amount of diisocyanate to be treated should not exceed 10% of the amount of decontaminent used. The mixture should remain in the open-top drum for 24 - 48 hours in a well ventilated area. Diisocyanates on spill surfaces can be neutralised by adding the decontaminent to the diisocyanate. The time required for neutralisation to occur will be at least 30 minutes.

Empty contaminated drums or containers can be treated with decontaminant liquid and rinsed with water.
1.8 AIR SAMPLING EQUIPMENT

a) Testing equipment with sampling tubes.

<table>
<thead>
<tr>
<th>Producer</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUER or SA</td>
<td>Gastester II</td>
</tr>
<tr>
<td></td>
<td>5146 – 701</td>
</tr>
<tr>
<td>Dräger</td>
<td>Gasspurpumpe</td>
</tr>
<tr>
<td></td>
<td>GsG 21/31</td>
</tr>
</tbody>
</table>

b) Sampling tubes for TDI are available from Dräger.

c) Fast response monitor for the detection of a target gas.

   For example the MDA SPM Acutely Toxic Gas Monitor from Honeywell Analytics which is portable with a quick response time and range from 0-60 ppb. The monitor has a paper detection system and is suitable for both MDI and TDI. Another option could be the Isocyanate monitor from Scot Industries with the same options and a range from 0-200 ppb. For further details consult the internet.

2 SPECIAL EQUIPMENT FOR DEALING WITH DRUMS AND INTERMEDIATE BULK CONTAINERS (IBCs)

2.1 OVERSIZED DRUMS FITTED WITH A TOP VALVE FOR VENTING

2.2 SPIKE FOR PUNCTURING BULGING DRUMS/CONTAINERS

* Update
PURPOSE

The incumbent has the responsibility for coordinating the ISOPA diisocyanate emergency response within his or her “territory”, managing and ensuring effective operation of diisocyanate ER resources and developing procedures to ensure effective initiation (“call out”) of the scheme by Member Companies and by other relevant parties.

It is the intention that the ISOPA ER scheme should become integrated into national and pan-European chemical emergency response schemes over time. ISOPA wishes to ensure (by its contribution) that the quality of the diisocyanate ER so provided is of a high standard and the provision of Mutual Aid for Member Companies remains effective.

The incumbent has the responsibility of managing this transition, linking the timing and the pace of integration to emergence of effectiveness of the chemical ER schemes.

PRINCIPAL ACCOUNTABILITIES

1 MANAGING ISOPA ER RESOURCES

- Manage and ensure effective operation of all ISOPA diisocyanate ER resources within his territory. Monitor ER equipment and the availability and training of staff providing ER intervention within his territory.

- Organise and maintain an effective “call out” procedure, ensuring that other Member Companies are fully informed of the procedure and any changes that may be implemented.

  - Where equipment and human resources needed for effective ER within the “territory” are not directly available from Member Companies, take steps to establish “diisocyanate equipment and human resources centres”, at Member Company/affiliates sites (e.g. refinery sites, chemical operations) where there is a general ER capability.
  
  - Oversee the management of “resource centres” and any diisocyanate related training required, to ensure operational effectiveness.

- The provision of specialist advice and the control of on-site intervention is to remain fully the responsibility of Member Company and the incumbent
will establish procedures to ensure effective co-operation between company diisocyanate experts and the “resource centres”.

- Establish procedures to ensure an effective media response where required.

- Report on any incident (see annex 6) and provide an annual status report to the ISOPA ER committee. Keep up to date on operating experience and developments in the other “territories” to ensure standards are harmonised at a high operational level.

2 MANAGING THE INTEGRATION OF ISOPA’S EMERGENCY RESPONSE INTO NATIONAL AND PAN-EUROPEAN CHEMICAL ER SCHEMES

- Establish close links with national emergency services / chemical industry intervention schemes, monitoring their effectiveness and ensuring that practical advice, support and assistance for diisocyanates emergencies is available as and when needed.

- Where national / pan-national intervention schemes are of an appropriate standard, make arrangements to achieve integration of the ISOPA ER into such schemes, ensuring that ISOPA can continue to contribute its diisocyanate specialist knowledge and resources at Member Company discretion. Ensure that Mutual Aid for other Member Companies continues to be available and that an inter-company call out system for mutual aid remains operational.

JOB REQUIREMENTS/COMPETENCIES

1. A good knowledge of English, both spoken and written.

2. Strong management and interpersonal skills.

3. Familiarity with technical aspects of diisocyanates and with transportation systems.

4. A good understanding of the practical delivery of emergency response. Familiarity with ISOPA, national and pan-national ER schemes.

5. Seniority and ability to influence diisocyanate logistics/safety matters within the Member Company.
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of caller</td>
<td>Company/Authority</td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td>Fax</td>
<td></td>
</tr>
<tr>
<td>Location of incident (road, town, country)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What happened</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product name(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN number</td>
<td>Hazard number</td>
<td></td>
</tr>
<tr>
<td>Emergency Act Code</td>
<td>Label</td>
<td></td>
</tr>
<tr>
<td>Product type:</td>
<td>Liquid</td>
<td>Pellets</td>
</tr>
<tr>
<td>Incident type :</td>
<td>Production</td>
<td>Terminal</td>
</tr>
<tr>
<td></td>
<td>Ship</td>
<td>Rail</td>
</tr>
<tr>
<td>Containment:</td>
<td>Tanker</td>
<td>Drum</td>
</tr>
<tr>
<td>Unit size/weight</td>
<td>Total</td>
<td>Amount damaged</td>
</tr>
<tr>
<td>Fire</td>
<td>Spillage</td>
<td>Amount of spillage</td>
</tr>
</tbody>
</table>
Remarks (weather, topography, environment) ………………………………………………………………...
………………………………………………………………………………………………………………………
………………………………………………………………………………………………………………………
………………………………………………………………………………………………………………………
………………………………………………………………………………………………………………………
Supplier …………………………………………………………………………………………………………….
Carrier …………………………………………………………………………………………………………………
Consignee …………………………………………………………………………………………………………….

Measures taken by: Police □ Fire brigade □ Medic □ Driver □

Other ……………………………………………………………………………………………………………….

Type of help required:
LEVEL 1
INFORMATION
Product □

LEVEL 2
EXPERT TO SITE
Product □

LEVEL 3
EQUIPMENT TO SITE
Firefight □

Product □

Technical □

Technical □

Medical □

Medical □

Clean-up □

Action taken ………………………………………………………………………………………………………

Spelling alphabet
A alpha          E echo             I india            M mike          Q quebec            U uniform              Y yankee
B bravo          F foxtrot         J juliet             N november  R romeo             V victor                  Z zulu
C charly         G golf             K kilo              O oscar         S sierra              W whisky
D delta          H hotel            L lima              P papa          T tango               X x-ray
<table>
<thead>
<tr>
<th>COMPANY</th>
<th>PRODUCT DESCRIPTION</th>
<th>DATE OF INCIDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Location of the incident

Country

- Railway
- Sea
- Road
- Production
- Distribution (warehouse)

### DESCRIPTION OF THE INCIDENT

<table>
<thead>
<tr>
<th>Quantity shipped</th>
<th>Quantity spilled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Shipping point</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cause of incident, actions taken and impact on persons and environment:

* *

### MEDIA INVOLVEMENT

* *

### FOLLOW-UP INFORMATION (long term effect on human health and environment, learning experience)

* *
### List of Contact Numbers of the current schemes

(always phone first) Issue – September 2009 Update

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>NATIONAL SCHEME</th>
<th>NATIONAL CENTRE</th>
<th>EMERGENCY TELEPHONE (T)</th>
<th>FAX (F)</th>
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</thead>
<tbody>
<tr>
<td>Austria</td>
<td>TUIS</td>
<td>BASF Ludwigshafen</td>
<td>T +49 621 6043333</td>
<td>F +49 621 6092664</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>TRINS</td>
<td>Unipetrol RPA Litvinov</td>
<td>T +420 4 76709826</td>
<td>F +420 4 76164322</td>
</tr>
<tr>
<td>* Denmark</td>
<td>RVK</td>
<td>Danish Emergency Management Agency (DEMA)</td>
<td>T +45 90 6000</td>
<td>F +45 35 365620</td>
</tr>
<tr>
<td>* Finland</td>
<td>FINTERC</td>
<td>Helsinki area Emergency Centre</td>
<td>T +358 9 39461</td>
<td>F +358 9 3946480</td>
</tr>
<tr>
<td>France</td>
<td>Transaid</td>
<td>CERRE Brest</td>
<td>T +33 2 98 331010</td>
<td>F +33 2 98 449138</td>
</tr>
<tr>
<td>Germany</td>
<td>TUIS</td>
<td>BASF Ludwigshafen</td>
<td>T +49 621 6043333</td>
<td>F +49 621 6092664</td>
</tr>
<tr>
<td>* Hungary</td>
<td>VERIK</td>
<td>Szazhalombatta</td>
<td>T +36 23 553915</td>
<td>F +36 23 551909</td>
</tr>
<tr>
<td>* Italy</td>
<td>SET</td>
<td>SPM Porto Marghera</td>
<td>T +39 041 5382432</td>
<td>F +39 041 931983</td>
</tr>
<tr>
<td>Netherlands</td>
<td>TRC</td>
<td>DCMR</td>
<td>T +31 10 2468642</td>
<td>F +31 10 2468404</td>
</tr>
<tr>
<td>Norway</td>
<td>RVK</td>
<td>The Norwegian Coastal Administration</td>
<td>T +47 33 034800</td>
<td>F +47 33 034949</td>
</tr>
<tr>
<td>Spain</td>
<td>CERET</td>
<td>CERET</td>
<td>T +34 935 209000</td>
<td>F +34 935 209413 or 14</td>
</tr>
<tr>
<td>* Sweden</td>
<td>Kemiakuten</td>
<td>GIC</td>
<td>T +46 8 6100565</td>
<td>F +46 8 6100570</td>
</tr>
<tr>
<td>* Switzerland</td>
<td>Chemiefachberatung</td>
<td>Novartis Basel</td>
<td>T +41 61 4681000</td>
<td>F +41 61 4684584</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Chemsafe</td>
<td>National Chemical Emergency Centre (NCEC)</td>
<td>T +44 186 5407444</td>
<td>F +44 123 5463070</td>
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* Update

UNDER REVIEW

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<thead>
<tr>
<th>COMPANY</th>
<th>24 HOUR TELEPHONE</th>
<th>FOCAL POINT MANAGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASF</td>
<td>+49 180 2273112</td>
<td>-</td>
</tr>
<tr>
<td>BAYER</td>
<td>+49 214 3099300</td>
<td>W. Hoerst</td>
</tr>
<tr>
<td>BORSODCHEM</td>
<td>+36 48 511515</td>
<td>A. Stefan</td>
</tr>
<tr>
<td>DOW</td>
<td>+31 115 664962</td>
<td>E. de Souter</td>
</tr>
<tr>
<td>HUNTSMAN</td>
<td>+31 181 292131</td>
<td>L. Wendels</td>
</tr>
<tr>
<td>SHELL</td>
<td>+44 1235 239670</td>
<td>-</td>
</tr>
<tr>
<td>VENCOREX</td>
<td>+33 476 695656</td>
<td>A. Vertupier</td>
</tr>
</tbody>
</table>

* UNDER REVIEW *
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