

EBAM

EUROPEAN BASIC ACRYLIC MONOMER GROUP

DRIVERS

Material

Working Safely with the Acrylic Monomers



WORKING SAFELY WITH ACRYLIC MONOMERS

ACRYLIC ACID & ACRYLIC ESTERS

INTRODUCTION

This presentation provides general information on the Safe Handling and Storage of stabilized (inhibited) Acrylic Acid and Acrylic Esters, **also referred to as:**

- Acrylates
- Acrylate Esters
- Acrylate Monomers

1

The following instruction is a contribution of the European Basic Acrylic Monomer Manufacturers Association EBAM

2

EBAM believes the information contained is factual

3

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THE EUROPEAN BASIC ACRYLIC MONOMER MANUFACTURERS ASSOCIATION **EBAM**

AND ITS MEMBER COMPANIES

are committed to protect Health and Life, to foster Industrial Security and Hygiene, and to protect our Environment.

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2 Exposure Control/Personal Protection Equipment & Skin contact effect

3 First Aid

4 Other Health Hazards

5 Reactivity of Acrylic Monomers

6 Fire on tank trucks

7 Industrial Hygiene

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1. SAFE HANDLING

TAKE CONSTANT CARE AND ATTENTION WHEN WORKING WITH ACRYLIC MONOMERS!

Before starting to work with Acrylic monomers identify the product and make yourself familiar with the **hazards** of these materials

The **material safety data sheets (MSDS)** of the respective **Acrylic monomer** provides all the necessary information to handle this product safely. Ask your supervisor for the MSDS.

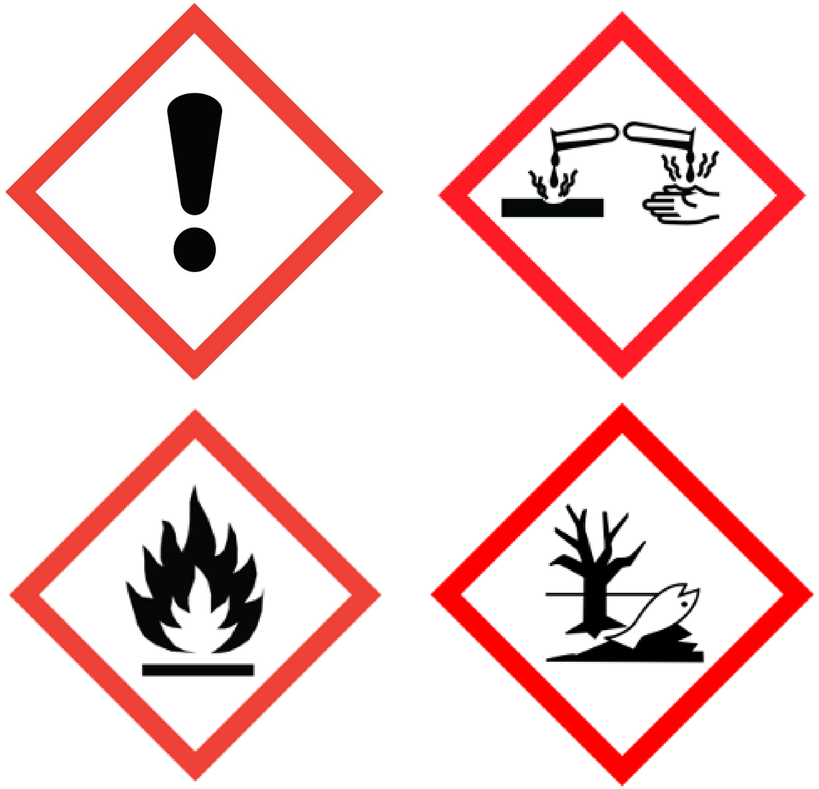
ACRYLIC MONOMERS MAY BE HARMFUL

1. by inhalation
2. in contact with your skin
3. or if swallowed.

Or: they may be classified as flammable or even highly flammable.

Or they can cause explosions

They can also be very harmful to the environment.



SAFE HANDLING

OVERVIEW OF 'ACRYLIC MONOMERS' PHYSICAL PROPERTIES

		Acrylic acid	Methyl acrylate	Ethyl acrylate	n-Butyl acrylate	2-Ethyhexyl acrylate
Freezing point	°C	**13**	-77 to -75	-72 to -71	-64,6	-90
Flashpoint	°C	48,5	-3 to -2	8 to 9	36 to 40	82 to 87

A SHORT OVERVIEW OF 'ACRYLIC MONOMERS' HAZARDS!

	CAS-Nr.	Inhalation Skin contact Swallowing	Inhalation Skin contact	Skin Contact	Flammability	Enviroment
Acrylic acid	79-10-7	harmful	harmful	Severe skin burns Severe eye damage	flammable	Very toxic to aquatic life
Methyl acrylate	99-33-3	harmful	irritating	sensitising	highly flammable	harmful
Ethyl acrylate	140-88-5	harmful	irritating	sensitising	highly flammable	harmful
n-Butyl acrylate	141-32-2		irritating	Sensitising	flammable	harmful
2-Ethylhexyl acrylate	103-11-7		irritating	sensitising		

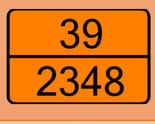
TRANSPORTATION

FOLLOW THE REQUIRED TRANSPORTATION REGULATIONS FOR ACRYLIC MONOMERS !



TRANSPORTATION

OVERVIEW OF 'ACRYLIC MONOMERS' - HAZARDS

	Acrylic acid	Methyl acrylate	Ethyl acrylate	N-Butyl acrylate	2-Ethylhexyl acrylate
UN Number	UN2218	UN1919	UN1917	UN2348	
Signal Word	Danger	Danger	Danger	Warning	Warning
					
					
					
					

2. EXPOSURE CONTROL/PERSONAL PROTECTION - GENERAL

Personal Protective Equipment (PPE) must be worn !

PPE should be selected based on the **potential for exposure** to a particular chemical and the **unique properties** of that **chemical**.



PERSONAL PROTECTIVE EQUIPMENT (PPE) - BODY PROTECTION

- Working clothes
- Hand protection
- Eye protection
- Protecting boots
- Hard hat





PERSONAL PROTECTIVE EQUIPMENT (PPE) - HAND PROTECTION

- **Rubber gloves** – splash protection only
- **Butyl rubber** with min 0.7 mm coating thickness **– the best wear & permeation characteristics**
- **Laminate gloves** (4HR glove) – the best permeation characteristics
- **Laminate gloves + standard rubber gloves** = required mechanical resistance





PERSONAL PROTECTIVE EQUIPMENT (PPE) - EYE PROTECTION

Safety glasses with side shields or **chemical splash goggles** depending by company requirements.









SKIN CONTACT EFFECT

1. Corrosive
    - Acrylic acid
2. Irritant
    - Eyes, skin, mucous membranes, etc.
3. Sensitizer
    - Skin

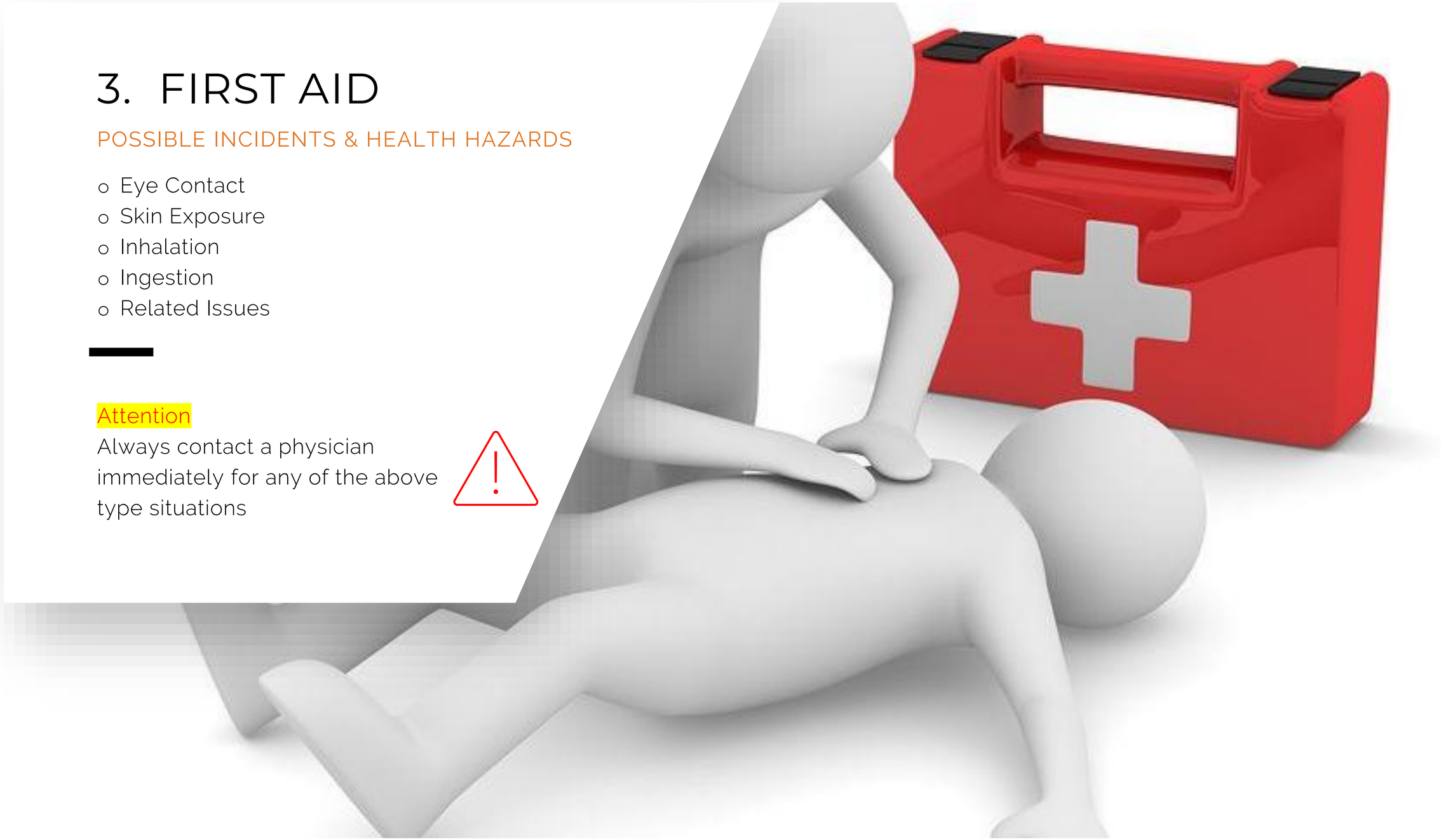
3. FIRST AID

POSSIBLE INCIDENTS & HEALTH HAZARDS

- Eye Contact
- Skin Exposure
- Inhalation
- Ingestion
- Related Issues

Attention

Always contact a physician immediately for any of the above type situations



FIRST AID – GENERAL CONSIDERATIONS

- Prompt and proper First Aid makes the difference
- The sooner the better
- Always seek a physician
- Give appropriate information to medical doctors
- Check and get known your operation area!
- Pay attention as a first responder while helping an injured person with regard to contact with the chemical

1

The location of all emergency **eyewash stations and showers** should be known



2

The phone number(s) to call for emergency **medical services** and all specific emergency procedures should be readily accessible

3

The person who has been exposed to Acrylates should be **removed** from the area to prevent further exposure

4

The type of exposure the person has experienced should be determined by **eye or skin contact, inhalation or ingestion**

First aid :

EYE CONTACT

If the eyes have come into contact with Acrylic monomers, the sight will be extremely restricted

The normal reflex reaction is for the eye lids to firmly close



IN CASE OF EYE EXPOSURE TO ACRYLIC MONOMERS AT ANY CONCENTRATION, THE PERSON SHOULD IMMEDIATELY GO TO THE NEAREST EYEWASH STATION AND FLUSH EYES WITH WATER FOR AT LEAST 15 MINUTES WHILE HOLDING EYELIDS OPEN AND AWAY FROM THE EYES

- Seek the help of a physician immediately afterwards (ophthalmologist)
- Do not put any ointments or medications in the person's eyes unless specifically instructed by a physician

TIP

You have to be familiar with the eyewash stations in the vicinity of your workplace

ATTENTION

Do not rub the eyes

First aid :

SKIN EXPOSURE

All acrylic monomers will be absorbed through the skin, this may result in:

- Sensitization
- Irritation
- Blisters
- Burns



- **IMMEDIATELY** wash the exposed areas with copious amounts of water for **at least 15 minutes**.
- Seek medical treatment
- No ointments or medication should be applied to the skin without specific instruction from a physician

TIPS

- All contaminated clothing and footwear must be removed immediately
- Contaminated shoes and other leather items must be properly disposed of
- All contaminated clothing must be properly decontaminated (laundered) before re-use
- Under no circumstances should contaminated clothing be taken home for laundering
- Where decontamination is not feasible, clothing should be properly disposed of

ATTENTION

Do not take contaminated items home for laundering. Contaminated shoes must be discarded

First aid :

INHALATION

Inhalation of Acrylic monomers may result in:

- Irritation to the respiratory tract
- Drowsiness or headaches
- High exposure could result in pulmonary oedema



- Personnel affected by Acrylic monomers vapours must be moved at once to a well-ventilated area
- They should remain there without moving
- If an individual is not breathing, administer artificial respiration
- Seek medical treatment as soon as possible
- Transport to a clinic or hospital

TIPS

- If breathing is difficult, trained personnel should administer oxygen
- If the affected person is unconscious, place him in a stable position

ATTENTION

Do not leave the person unattended

First aid :

INGESTION

Ingestion of Acrylic monomers may result in:

- Irritation to the internal organs and digestion tract
- Nausea



- Have the person drink about a glass (0,2 litres) of water
- Immediately contact local emergency medical services or the local poison control centre for assistance

TIPS

- Vomiting of an acid can potentially cause burns to the oesophagus and other internal organs
- Never kept chemicals in containers reserved for food or beverages

ATTENTION

Do not induce vomiting



4. OTHER HEALTH HAZARDS

SENSITIZATION

- **Sensitisation** may occur even at skin contact with Acrylic esters at concentration levels which do not result in burns and blisters
- Sensitisation is a heightened bodily reaction to future exposures **to even minor** amounts of acrylic esters
- The **sooner** first aid is administered after contact the **better** the chances that injuries or sensitisation can be avoided

5. REACTIVITY OF ACRYLIC MONOMERS

Acrylic monomers require stabilisation to prevent hazardous polymerisation



Acrylic monomers are stabilised with **MeHQ (Monomethyl ether of Hydroquinone):**

- Acrylic Esters : 10 to 20 ppm
- Acrylic Acid : 180 to 220 ppm since it has a higher reactivity

To assure effectiveness of MeHQ, the following should be respected during transport:

- Oxygen-containing atmosphere (min 5vol% O2)
- Temperature range 15-25 °C for Acrylic acid
- Temperature range below 35 °C for Acrylic esters

If outside this range, you have a risk of uncontrolled polymerisation, please contact the Safety Expert within your Company

- If **freezing** occurs for Acrylic acid special care has to be taken!
- **Cleanliness** of the tank container is essential, Contamination with chemicals, cleaners or rust can cause polymerisation
- The stabiliser will become **ineffective** under **nitrogen purging**.

REACTIVITY OF ACRYLIC MONOMERS

Temperature below range (Acrylic acid)



- Below 15 °C, Acrylic acid will freeze

Special care has to be taken to the thawing of Acrylic acid which could take place at heating stations

- **Use warm water only (35°C max)**
- **Never use steam**
- **Never remove liquid from partially thawed acrylic acid**
- Monitor that the temperature stays within the acceptable range (15-25°C)

RESPECT THESE RULES TO AVOID UNCONTROLLED POLYMERISATION

REACTIVITY OF ACRYLIC MONOMERS

Control of temperature during transport



Temperature of Acrylic monomers must be controlled during transport

- It's recommended to check the truck thermometer 1 h after loading and at each stop
- If temperature is increasing rapidly (>5°C/h), it might be a sign of polymerisation

IF TEMPERATURE > 30 °C FOR ACRYLIC ACID
IF TEMPERATURE > 35 °C FOR ACRYLIC ESTERS

Place the tank far away from any habited area

Call your transport company and the product supplier, and follow their instructions

If necessary, a restabilisation product called "short-stopper" may be added by the firemen

IF TEMPERATURE REACHES 60 °C

All people need to be evacuated immediately, the tank may rupture violently.

EXAMPLES OF POLYMERISATION OF TANK TRUCKS



Heating station using abusive high temperature to heat frozen Acid (2019)



Monomer heated too hot, starting to polymerise during transport (2012)



Acrylic Acid thawed with NO temperature control & NO high temperature protection (1976)

Polymerisation once started generates heat, vaporises the flammable liquid, one ignition source may cause an explosion

ATTENTION!

ON PLACE, EXPLAIN TO EMERGENCY TEAM THAT AREA MUST BE EVACUATED IF TANK REACHES 60°C



6. FIRE ON TANK TRUCKS

- Use the **fire extinguisher** present in the truck cabin / on the truck (requested by ADR regulation)
- If the fire cannot be extinguished by this way, **evacuate** the area
- Call the **fire brigade**
- Call your **transport company** and the **product supplier**

7. INDUSTRIAL HYGIENE/ OPERATIONAL EXPOSURE LIMITS



- If you smell Acrylic monomers Investigate for leakage and, should there be any leak, call your company emergency number
- Ethyl Acrylate, Methyl Acrylate and Butyl Acrylate have very nasty odour which may annoy the neighbours
- Exposure Limits (OEL) can be found in MSDS



8. LEAK & SPILL CONTROL

Personal Protective equipment should be worn in case of leak or spill

- If possible, try to **contain** leakage from the container
- In case of leakage stay at safe distance and contact the safety expert within your company
- If the leak is serious contact the fire brigades

Acrylic monomers may be highly toxic to aquatic life and should not enter drains, sewers or watercourses





9. Unloading procedure:

GENERAL

Unloading procedures do differ from place to place but some general recommendations should be followed

- driver should check if emergency shower and eye wash facilities are present close by
- in case fall protection or other safety measures are not sufficient for the task prescribed to be done report a near miss
- the driver must stay close to the vehicle and monitor the unloading process
- when opening vapor vent valve – be careful - when the external (secondary) valve is leaking, acrylic monomers may flow out from the outlet.
- when starting the pump – **remember:** pumping against closed or blocked lines generates heat and may induce a polymerisation.

Unloading procedure:

MONOMER SPECIFIC

- the recommended method for unloading acrylic monomers is by pumping with a close loop system (vapor return line) where the displaced tank vapors are returned to the transportation vessel.
- it is recommended to use a dry disconnect coupling (dry break disconnect).

WHEN THE TRANSPORTATION VESSEL IS EMPTY THE FOLLOWING SHOULD BE DONE:

- pump should be shut off and internal and external discharge valves should be closed
- lines should be depressurized, drained and flexible hoses and lines disconnected. Replace all caps
- close and secure hoses. Leave labels in place.
- disconnect grounding and remove wheel chocks.

10. SUM UP

- TEMPERATURE MONITORING IS CRUCIAL - REPORT HIGH AND LOW TEMPERATURES IMMEDIATELY AND DO NOT CONTINUE THE TRANSPORT
- LOADING/UNLOADING PLACE EMERGENCY PROCEDURE SHOULD BE KNOWN

1 High temperature or lack of oxygen will cause polymerisation

2 Never use steam to thaw acrylics (for example frozen flanges)

3 Contamination with any chemicals, cleaners or rust may cause polymerisation

4 Evacuate the area if the tank reaches 60˚C

5 Acrylics monomers are dangerous chemicals, wear appropriate PPE

6 In case of contact with eyes or skin, wash with water for at least 15 minutes and contact a physician



Thank you

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