Filling and transshipment of substances hazardous to water

Filling and transshipment

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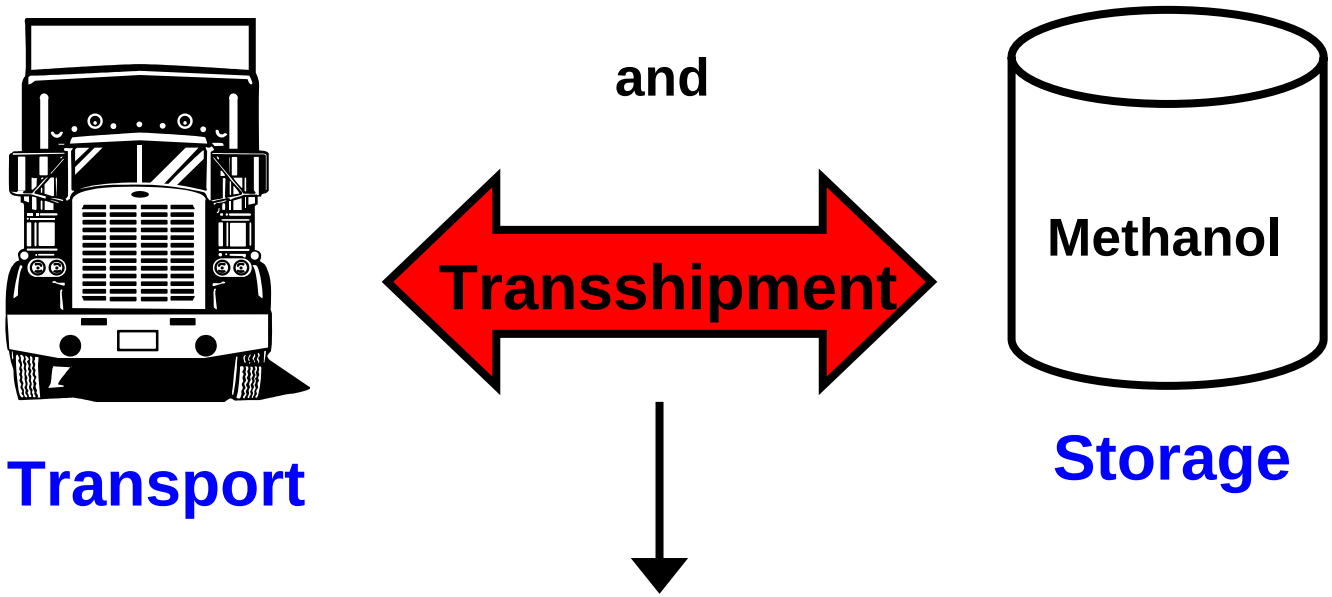
- **<u>Transshipment</u> is a connecting link between**



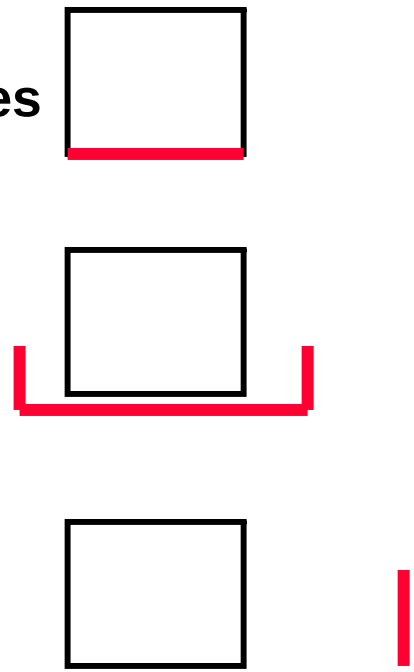
stationary area
when loading/offloading and filling
of ships, trucks or railway wagons
and vice versa

Filling and transshipment of substances hazardous to water

- **Furthermore, only the following process are to be considered**
  - **Loading of railway tank wagon (RTW)**
  - **Loading of road tanker (RT)**
  - **Filling and emptying of movable vessels (e. g. container)**

Filling and transshipment of substances hazardous to water

- **Which requirements are expected of this units?**
  - ❑ **sufficient tightness of the sealed surfaces**
  - ❑ **sufficient containment capacity**
  - ❑ **infrastructural measures (organisational or technical)**



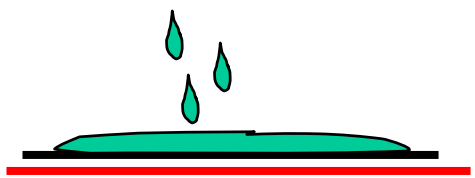
Filling and transshipment of substances hazardous to water

ICPE recommendations for transshipment sites

mechanical stress

resistant

spilled liquid



sufficiently tight + durable

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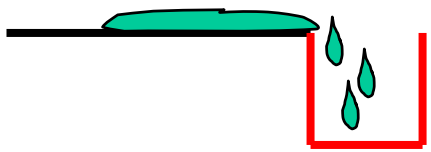
ICPE recommendations for transshipment sites

Collecting facilities



collecting the spilt liquid

capable of accommodating the volumes of liquid that can escape until

- → **suitable measures or**
- → **automatic safety devices**

Filling and transshipment of substances hazardous to water

- **Determining the containment capacity when filling**

$$R = V \cdot t_A$$

R	Containing capacity in m^3
V	Volumetric rate of flow in m^3/h
t_A	Time lapse until adequate safety measures will be effective in hours

<u>Mechanical damage of a pipe:</u>
This should be taken into consideration if liquid can flow out on both ends of a pipeline when there is a mechanical damage

Filling and transshipment of substances hazardous to water

- **Determination of the volumetric rate of flow**

  - **<u>when using a pump</u>:**
    maximum discharge capacity of the pump

  - **<u>As a free discharge:</u>**

$$V = 3600 \bullet A \sqrt{2gh}$$

V	**volumetric rate of flow in m3/h**
A	**cross section of the pipeline**
g	**9,81 m/s² acceleration of gravity**
h	**maximum height in m**

Filling and transshipment of substances hazardous to water

- **Determination of the time lapse until adequate safety precautions becomes effective**

$$t_A = t_T + t_R$$

t_T dead time	the time a reacting systems needs to recognise an incoming signals as being relevant
t_R reaction time	the time a reacting systems needs to attain the set point after recognising incoming signals

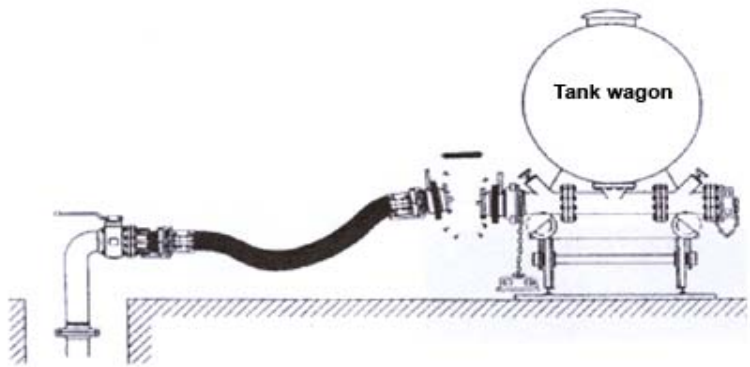
Filling and transshipment of substances hazardous to water

- **Filling with a fulcrum arm or a flexible metal pipeline with automatic snap connector**

$t_T = 0$

$t_R = 0$

R = minimum containing capacity = content of the pipeline



Filling and transshipment of substances hazardous to water

- **Filling process with devices having attention key and Emergency-Off system (ANA)**

  t_T = 40 s

  t_R = 5 s

- **Filling process without details of the filling process**

  t_A = 5 min

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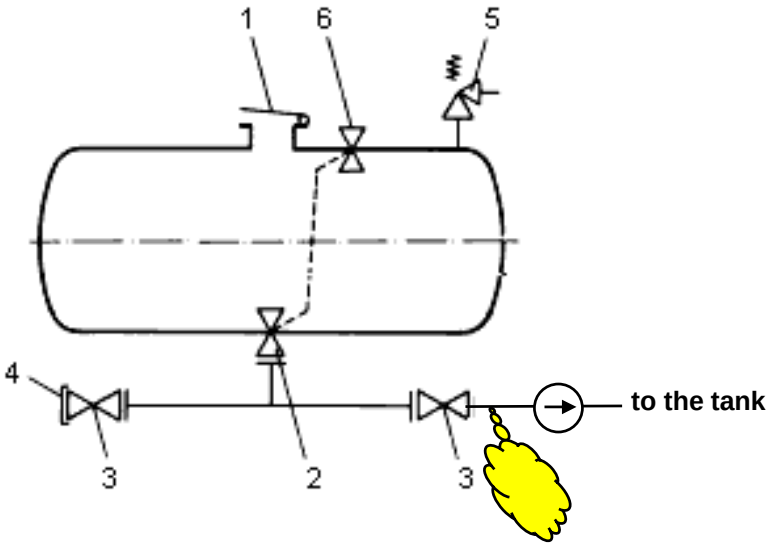
Calculated example 1



1 Opening (top, DN 500 – DN 600)
2 Internal valve at the bottom of container
3 Dispensing valve
4 Screw-on-type cap or blind flange
• Safety valve (if necessary)
6 Automatic aeration valve

Damage: damaged hose
Diameter of hose: DN 100
Length of hose: 10 m
capacity: 25 m^3
Liquid level: 3 m

$$V = 3600 \bullet \Pi/4\ (0{,}1)^2 \sqrt{2 \bullet 9{,}81 \bullet 3}$$

$$V = 216{,}92\ m^3/h$$

t_A = 5 min → R = ca. 18 m^3
t_A = 45 s → R = ca. 2,7 m^3
t_A = 0 s → R = ca. 80 Litre

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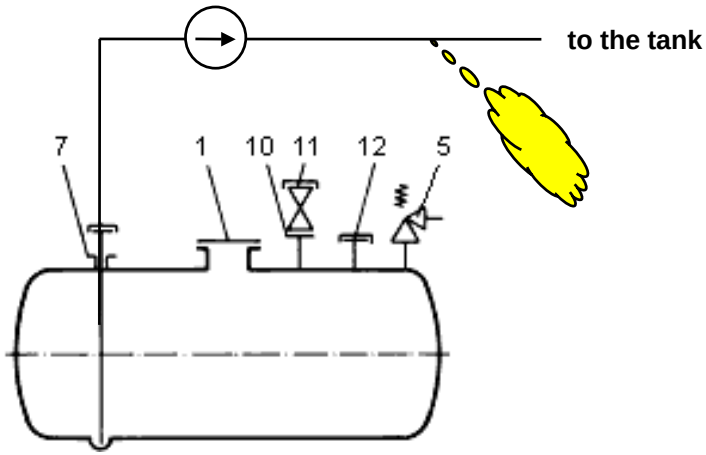
Calculated example 2



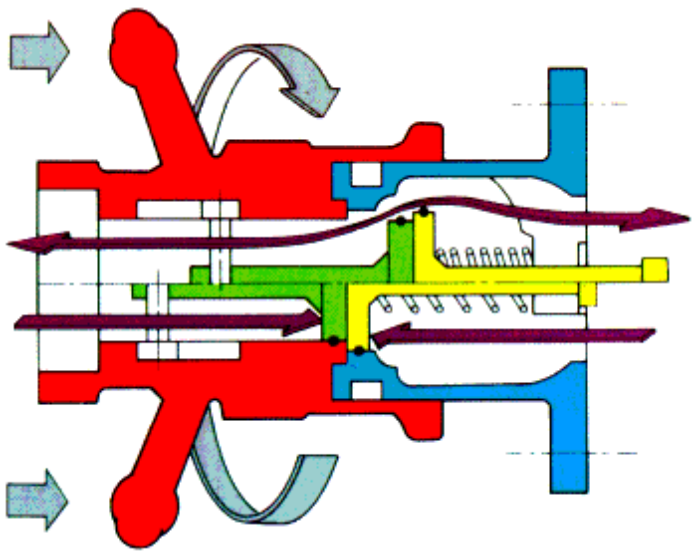
Damage:	damaged hose
Diameter of hose:	DN 100
Length of hose:	10 m
capacity:	25 m^3
Pumping capacity:	1.200 l/min

1	Opening (top, DN 500 – DN 600)
5	Safety valve (if necessary)
7	Port for riser (DN 125)
10	Pressure port (DN 40, blue)
11	Shut-off device on pressure port
12	Filling port (DN 150)

t_A = 5 min	**R = ca. 6 m^3**
t_A = 45 s	**R = ca. 900 Litre**
t_A = 0 s	**R = ca. 80 Litre**

Filling and transshipment of substances hazardous to water

- **Example of how leakage can be reduced when coupling and decoupling**
  - **Dry couplings**
    Couplings with automatic shut-off device on both sides to control leakage when decoupling



Filling and transshipment of substances hazardous to water

- **Determination of the containing capacity when filling liquids into other vessels**
  - **The containing capacity is equal to the volume of the used means of transport (e.g. palette)**

$$R = V_{\text{means of transport}}$$

  - **If the means of transport consist of several vessels, the individual volumes should be summed up.**

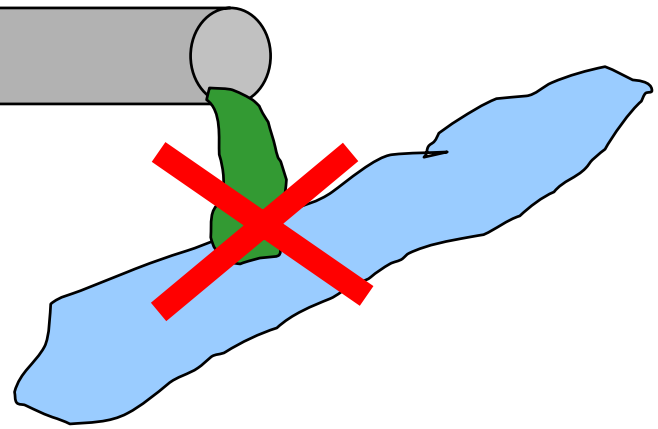
$$R = V_{\text{means of transport}} = \sum V_{\text{individual volumes}}$$

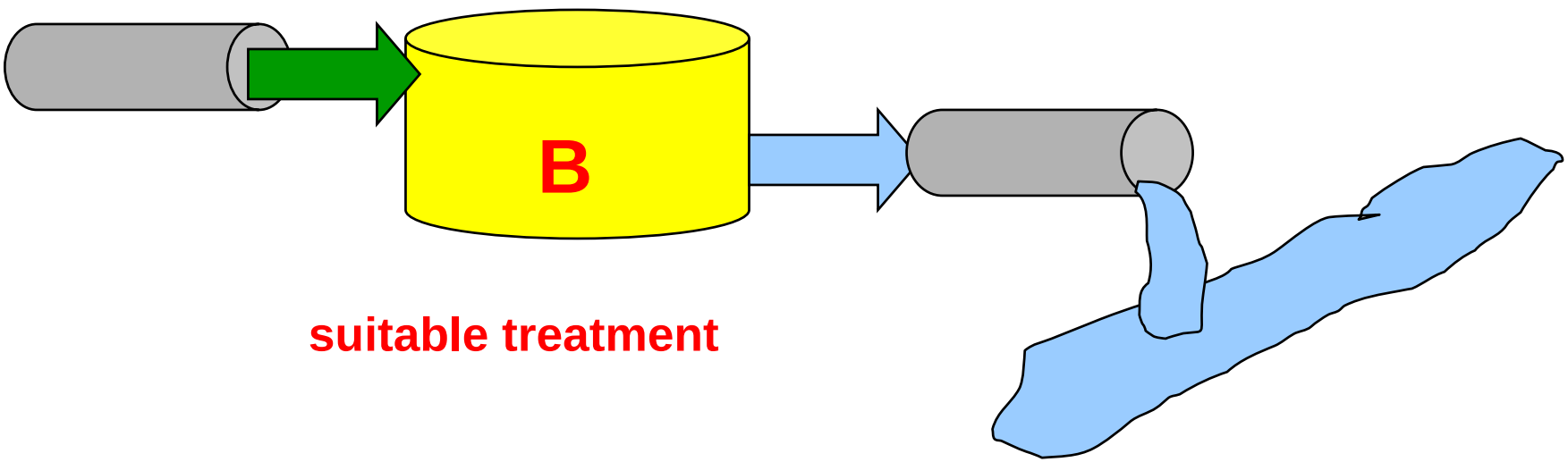
Filling and transshipment of substances hazardous to water

ICPE recommendations for transshipment sites

- contaminated rainwater
- resulting fire fighting water

Should not flow directly into seas and rivers





suitable treatment

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ICPE recommendations for transshipment sites

Retaining of contaminated rainwater and fire fighting water

Outdoor plants

- Retaining capacity = R+A*50 l/m²
- Waste water treatment plant (e.g. separator)

Plants installed under a roof

-The roofing must tower above the loading/offloading site by 0,6 times of the headroom

Filling and transshipment of substances hazardous to water

ICPE recommendations for transshipment sites

- Spilled substances hazardous to water must be detected in time.
- Provide devices to stop the spreading of spilled substances immediately + equipments to remove the substances
- Transshipment sites:
  - should be marked clearly
  - should be declared as safety zone during transshipment

Filling and transshipment of substances hazardous to water

ICPE recommendations for transshipment sites

- Avoid the transshipment of substances hazardous to water near the shores of a waterway especially for new installations
- The vessels (e.g. containers) should be clearly marked with danger symbols during the transshipment of dangerous materials: