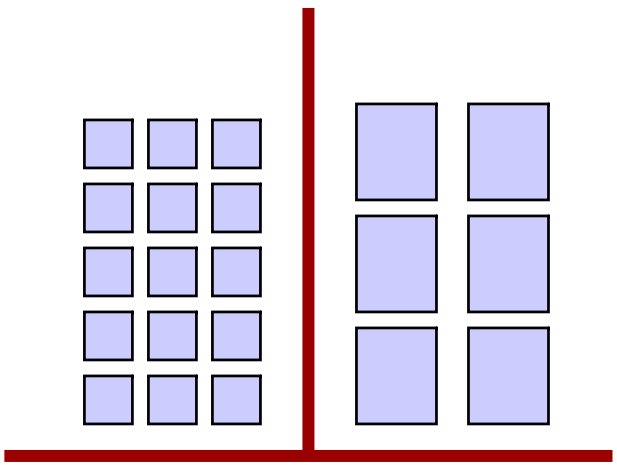
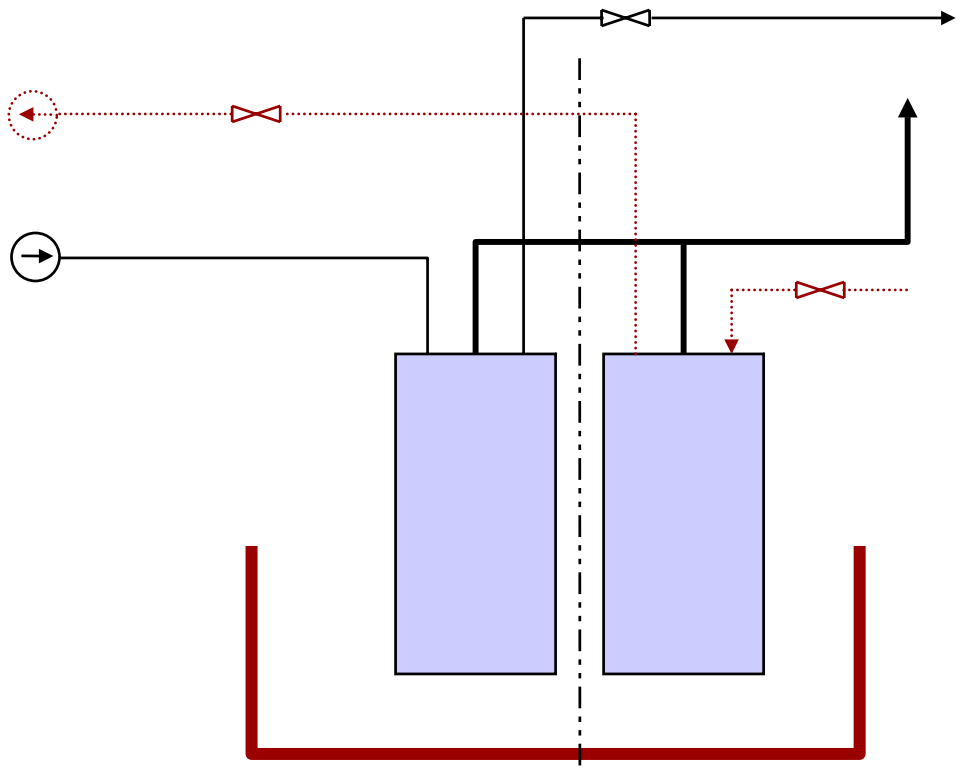
Safety precautions for storage units

Safety precautions for storage units

Storing is the process of keeping substances hazardous to water in containers to serve as depot for consumption, source of supply to others or for disposal.



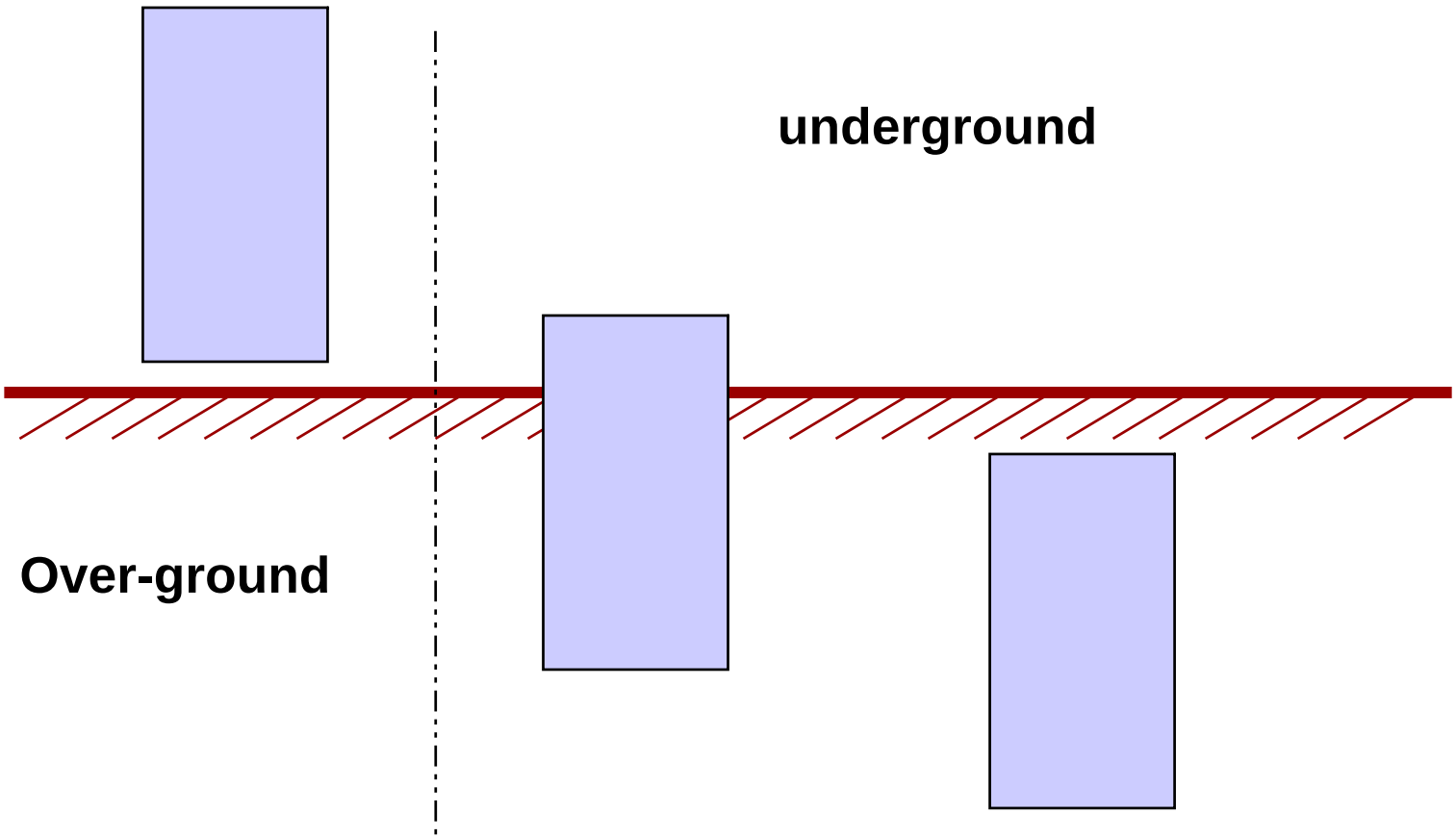


1. Storage unit **2. Storage unit** **3. Storage unit** **4. Storage unit**

Small barrel storage **Barrel storage** **Tank unit**

Safety precautions for storage units

Storage are grouped according to types in:

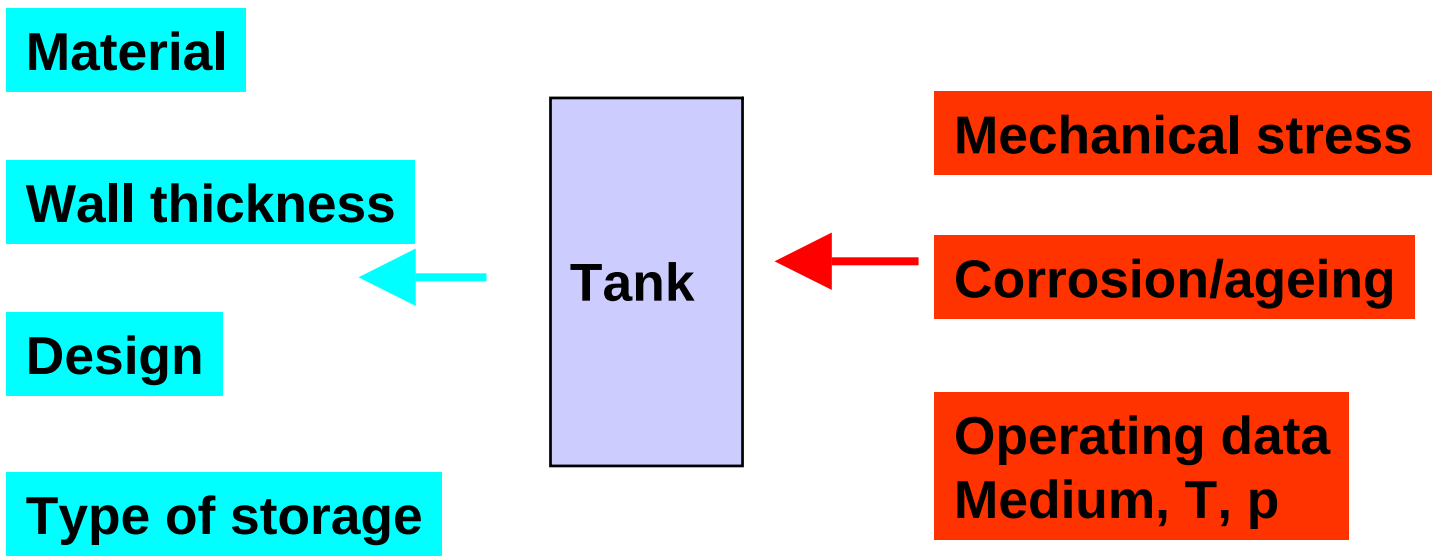


Safety precautions for storage units

stress:

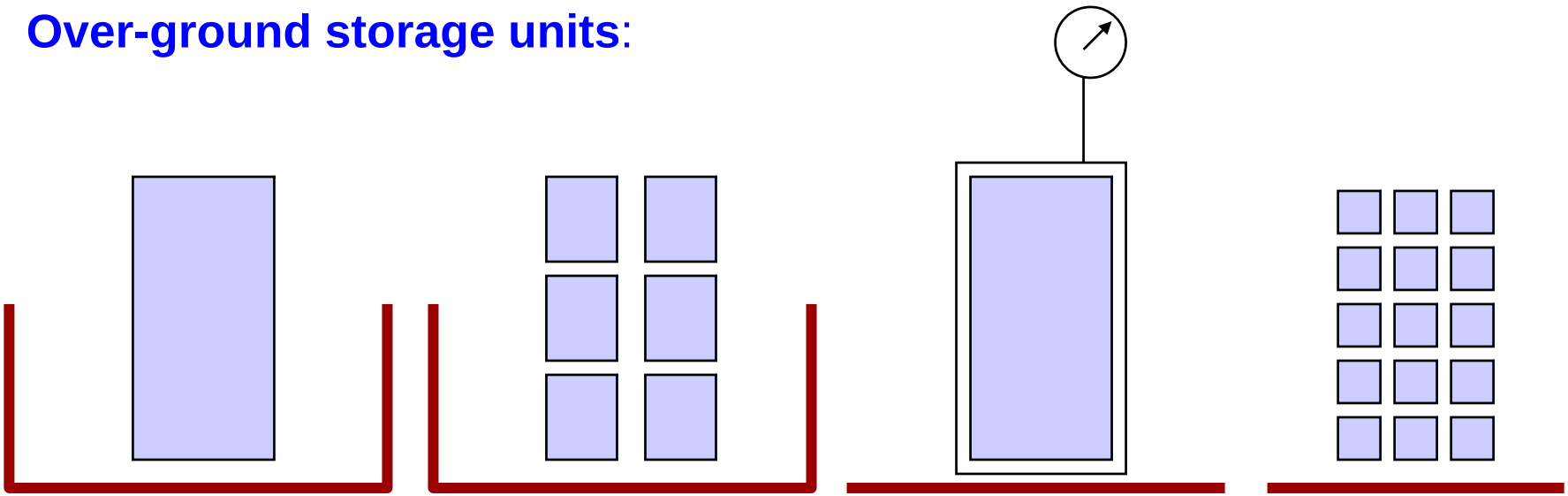
is defined by:

resistance against:



Safety precautions for storage units

Over-ground storage units:

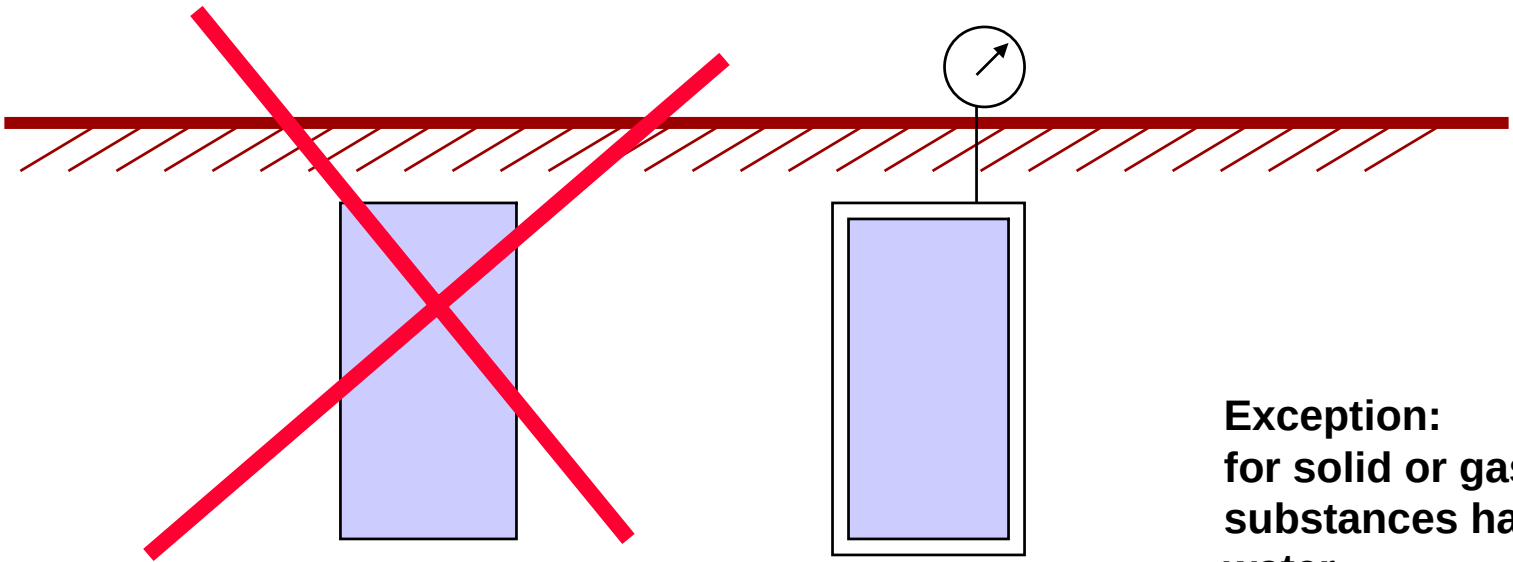


Installing the container in a sealed and durable secondary containment

Exception:
If other adequate measures has been taken to keep the environment safe in case of failure of the tank walls and has been demonstrated

Safety precautions for storage units

Underground storage units:



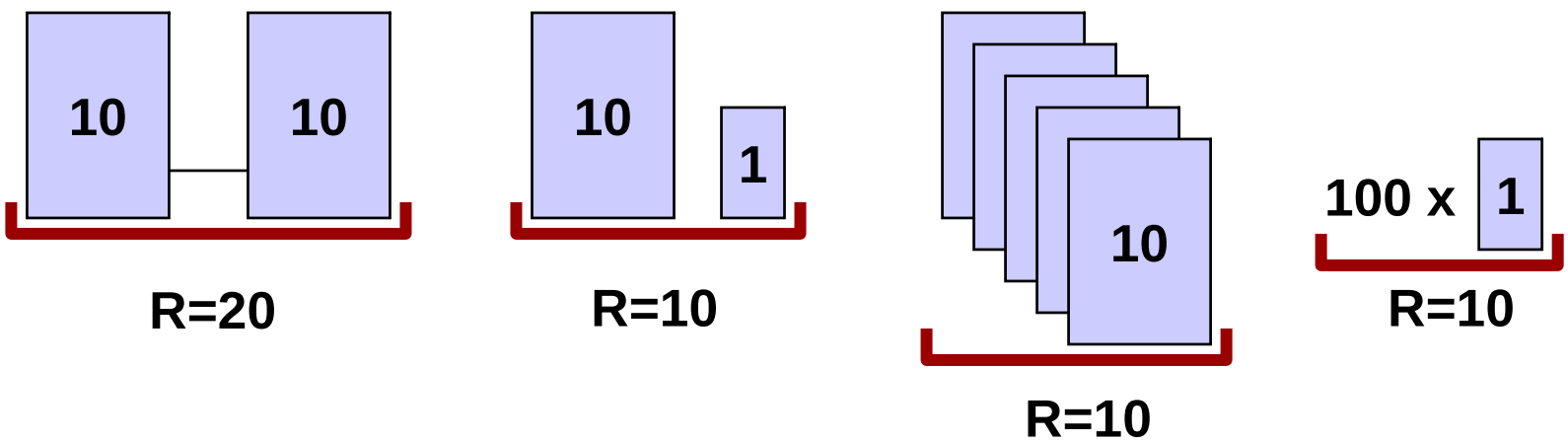
Exception:
for solid or gaseous substances hazardous to water

Single shell underground containers and pipelines are generally forbidden.

Safety precautions for storage units

Determination of capacity of the containment for stationary tanks:

- Volume of the plant units placed in it,
- the volume of the biggest tank if several units are placed in the containment. It should be able to retain at least 10 % of the whole volume of all units placed in it;
- Communicating containers are considered to be one container



Safety precautions for storage units

Determination of the capacity of the containment for mobile containers:

Total capacity of storage Total in m^3	Capacity of the containment
≤ 100	10 % of Total, At least the volume of the largest container
< 100 ≤ 1000	3 % of Total, However at least 10 m^3
> 1000	2 % of Total, However at least 30 m^3

Safety precautions for storage units

Small barrel storage:

- **Storing outdoors should be in tight containers or packages and they should be protected against damages and other climatic influences**

or

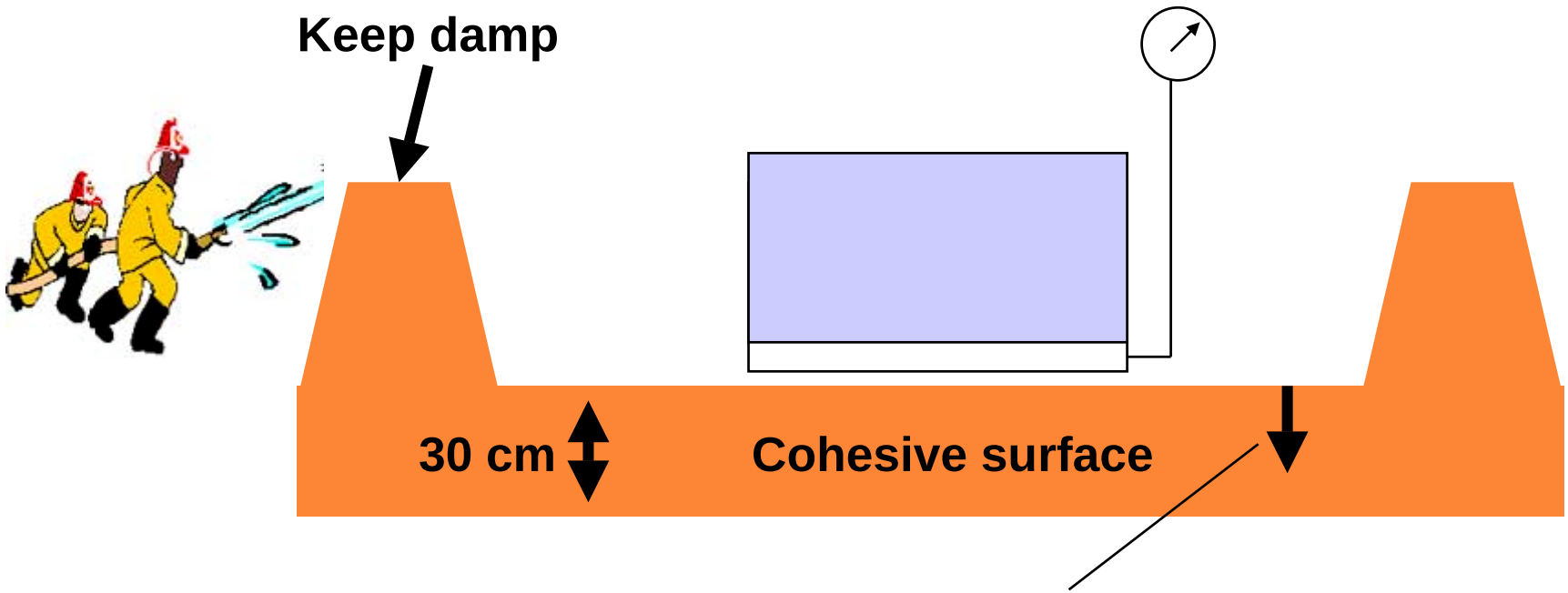
- **in closed rooms**

and

- **Cleaning up after accidents should be possible with simple operational means and be included in the operational instructions**

Safety precautions for storage units

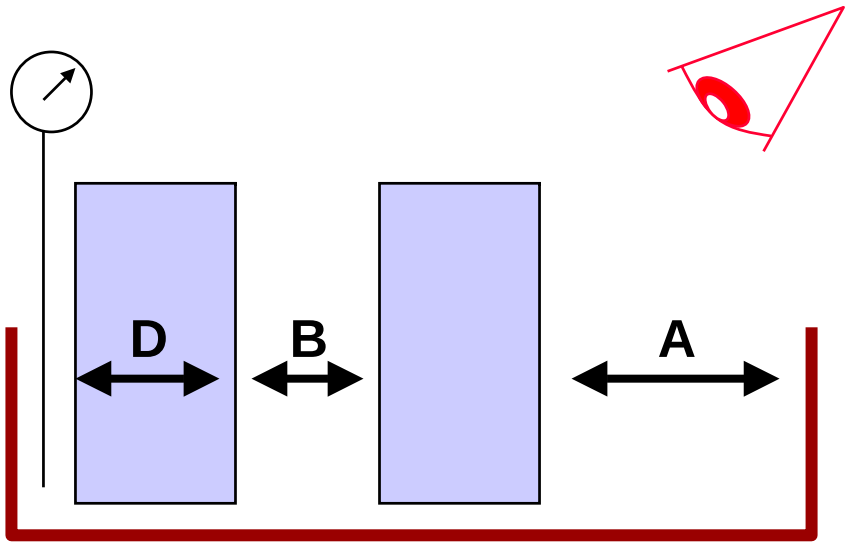
Peculiarities of secondary containment made of cohesive surface:



Water hazardous liquids should not penetrate the surface more than highest 20 centimetre within 72 hours

Safety precautions for storage units

Viewing:



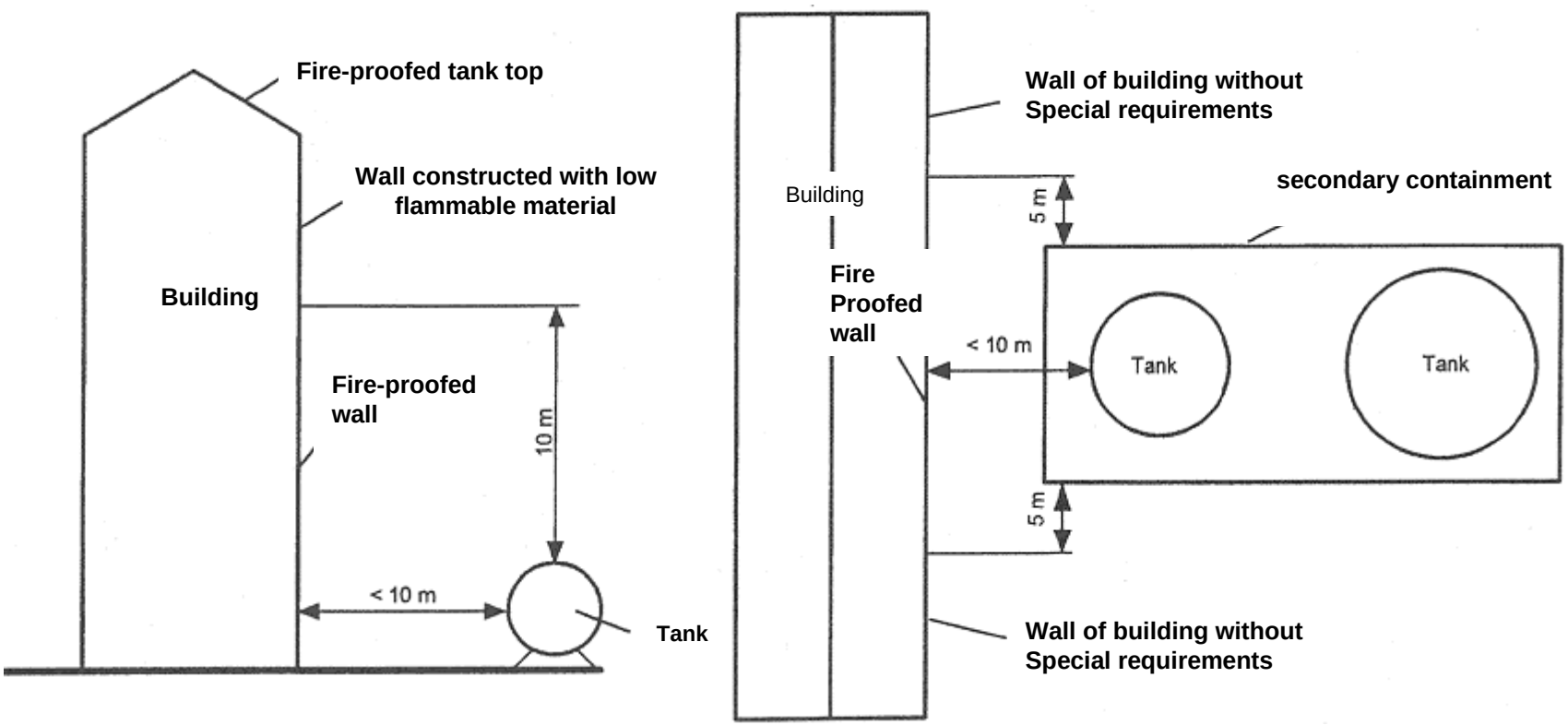
Height of container <1,5m
A= minimum 0,4 m

Height of container >1,5m
A= minimum 1,0 m

Number of tanks	Total volume	As a Rule
Up to 10	< 2000 m^3	B > 0,3 D minimum 1 m
Up to 10	> 2000 m^3 < 50.000 m^3	B > 0,3 D minimum 3 m
Up to 4	> 50.000 m^3	B > 0,5 D minimum 3 m

Safety precautions for storage units

The distance to the neighbourhood:

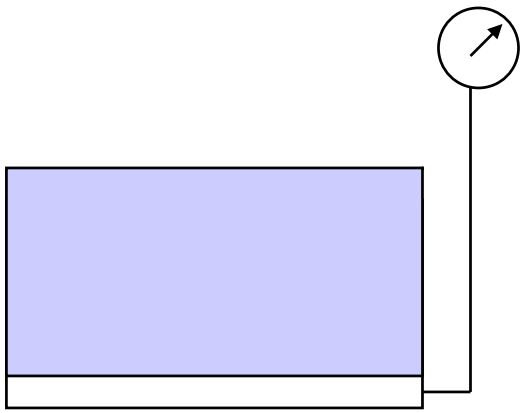


Safety precautions for storage units

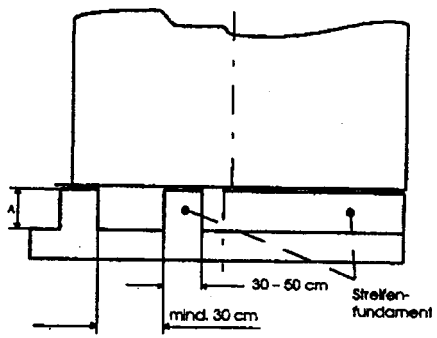
Distance to the bottom

Arrangement of flat bottom tanks

A quick and reliable detection of leakage at the bottom of the tank must be guaranteed



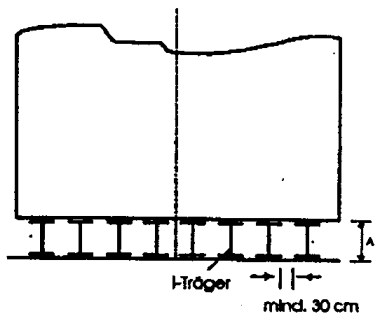
Leakage monitored double bottom



Strip foundation to allow for Inspection of the tank bottom from outside

Safety precautions for storage units

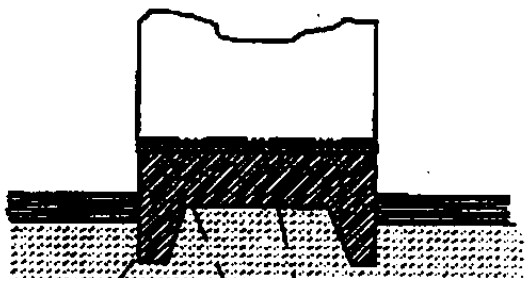
Distance to the bottom
Arrangement of flat bottom tanks
A quick and reliable detection of leakage
at the bottom of the tank must be guaranteed

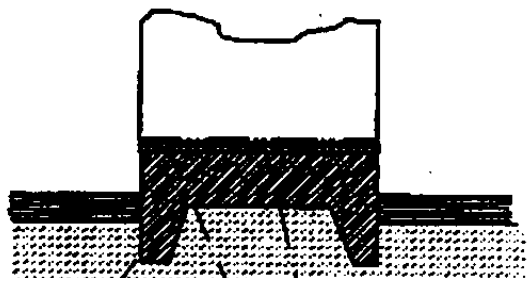


Tanks are installed on supporting beam on a joint-less concrete foundation to make an inspection of tank bottom possible from outside

Safety precautions for storage units

Distance to the bottom
Arrangement of flat bottom tanks
A quick and reliable detection of leakage at the bottom of the tank must be guaranteed





Jointless concrete foundation which is raised above the floor of the containment

With additional layer as barrier of metal plate made of stainless steel

Without additional layer as barrier but the tank bottom made of stainless steel

Safety precautions for storage units

Stability and damages:

- **Install the container in such a way that:**
  - → drifting
  - → inclination
  - → deformation

  that can endanger the safety of the container is avoided

- **over-ground container:**
  Guaranteeing the stability of the container after being exposed to fire for a period of 30 minutes

- **Erecting the container:**
  Erect containers in such a way that they are adequately protected against all possible external damages

- **Protection against flooding**

Safety precautions for storage units

Indoor storage

Limitation of the amount of stored substances in regard to the effects of fire outbreak:

Capacity of stationary tanks

Total volume of flammable liquids should not exceed 150.000 litres

Capacity of mobile vessels or tank container

Total volume of flammable liquids should not exceed 100.000 litres

Safety precautions for storage units

Joint storage:

	+	-	-	-	+
	-	+	-	-	-
	-	-	+	-	+
	-	-	-	+	o
	+	-	+	o	+

+ can be stored together

- should not be stored together

o only under certain circumstances

Safety precautions for storage units

Fire and protection against explosion:

Outdoor over-ground storage:

Protection against lightning for containers are necessary.

Installing the container + all plant units connected to the container:

Earthing to avoid electrical polarities;

Avoid : → **explosive sparks**

→ **dangerous corrosions**

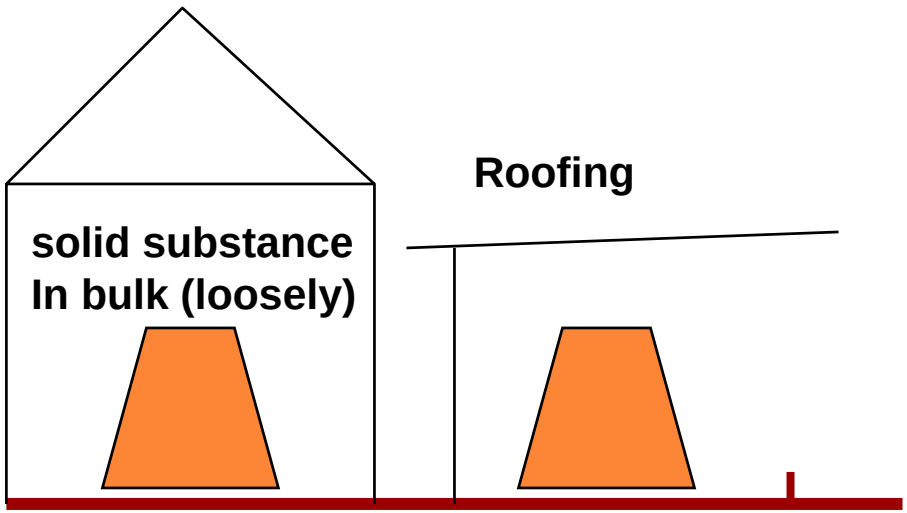
→ **hazards to human beings**

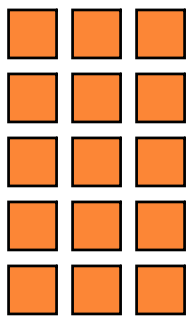
Securing the plant and plant components:

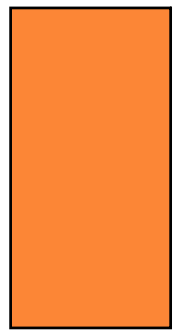
against electrostatic charges, which can lead to dangerous discharging processes → no danger of electrostatic charges should exist during filling processes

Safety precautions for storage units

Storage of solid substances:







Durable and impermeable floor

Safety precautions for storage units

Marking or labelling of storage units:

→ clearly legible

→ permanent and durable

→ which substances are hazardous to water

→ operational pressure