Pipelines for transporting substances hazardous to water

Pipelines for transporting Substances hazardous to water

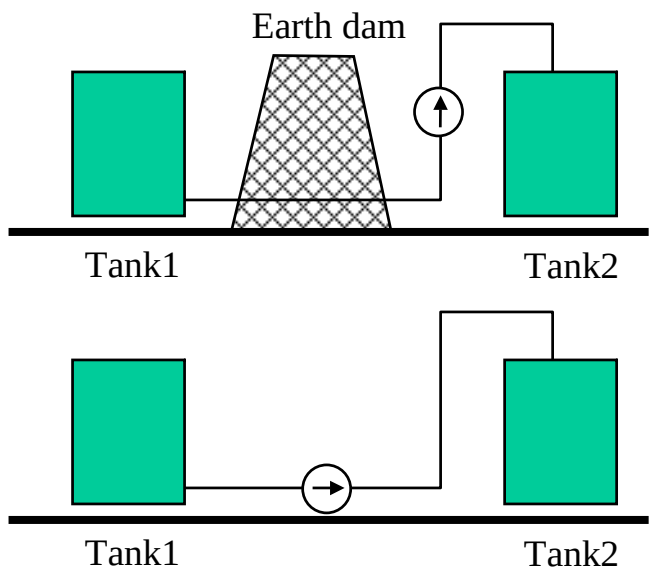
Pipelines for transporting substances hazardous to water

- Pipelines are systems for transporting substances hazardous to water within a factory. Pipelines consist apart from the pipes, especially fittings and flanges. Pumps are also a part of a pipeline system.

- They are divided into two categories

  - Underground pipelines (totally or partly installed beneath the earth surface)

  - Over-ground pipelines



Pipelines for transporting substances hazardous to water

Excerpts from the ICPE recommendations

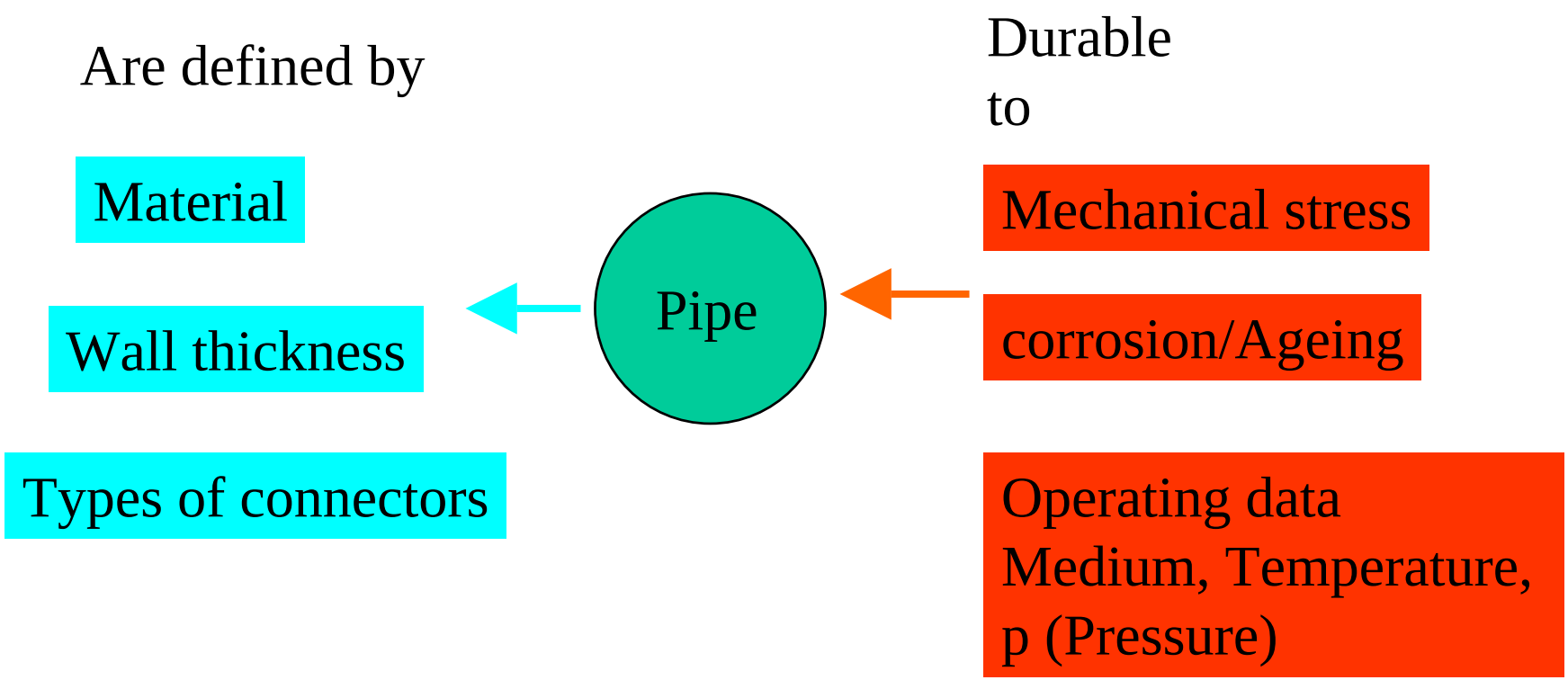
- Pipelines must enclose substances hazardous to water safely.

  To achieve this

- Certain aspects of safety must be considered when installing the pipelines (under-/over-ground).

Pipelines for transporting substances hazardous to water

Stresses



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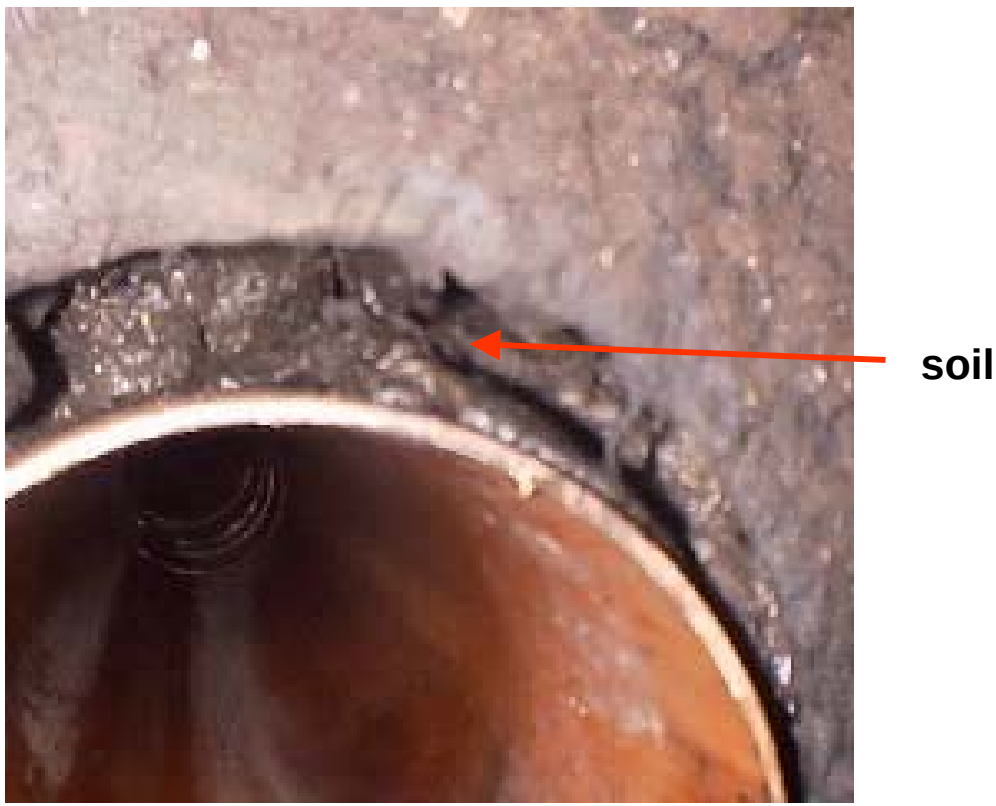
Example of a pipeline

Example of a connection without a seal



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Mechanical durability

- Drifting and declivity of the pipelines must not endanger their safety and tightness.
- Pipelines must be adequately protected against mechanical damages, e.g. being bumped by vehicles.

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- Example of protection against being bumped by vehicles

Bank (elevation as barrier)

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Durability against corrosion and substance

- **Protection against interior corrosion and medium**
  e.g. choosing suitable material or coating the interior part of the pipelines

- **Protection against exterior corrosion**
  e.g. choosing suitable material, protective paint or jacket coating, protection against corrosion with electrochemical means (e.g. Protection against corrosion with cathodes)

- **Proofs:**
  - **Bibliographical references**
  - **Object of reference**
  - **Laboratory experiments**

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Example of interior corrosion

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Excerpts from the ICPE recommendations

- Verification of tightness and resistance to corrosion should be subject to repeated checks by independent experts.

- Proof is required that the rate of attrition between the verification intervals does not result in any inadmissible weakening of the pipelines and most especially, localised corrosion should be ruled out.

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Example of the verification of the tightness of a pipeline with a tight bladder

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- **Durability against the operating data**
  - **Protection against excess temperature,** if the admissible operating temperature can be exceeded.
  - **Protection against excess pressure,** if the admissible operating pressure can be exceeded.

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Under-ground pipelines

- Under-ground pipelines should be installed only if the installation of over-ground pipelines is not possible for safety reasons or if they are connected to under-ground tanks.
- If it is necessary to install under-ground pipelines, there are some ICPE requirements concerning the technical design and installation to be met.
- When installing under-ground pipelines, detachable connections and fittings should be installed in a monitored tight control chambers (pits).

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Example of a forbidden under-ground pipeline

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Requirements on the technical design and installation

- Under-ground pipelines must be designed as a **double shell unit**; leakages on the wall of the pipeline must be indicated automatically by an approved leakage indicator, or
- They must be designed as **suction pipe**, in which the liquid column can be interrupted in case of leakage on the wall (self-protected) or
- They must be encased in a suitable **protective tube** or installed in a **duct**; spilled substances must be detectable in an **inspection chamber**.

Here are some examples:

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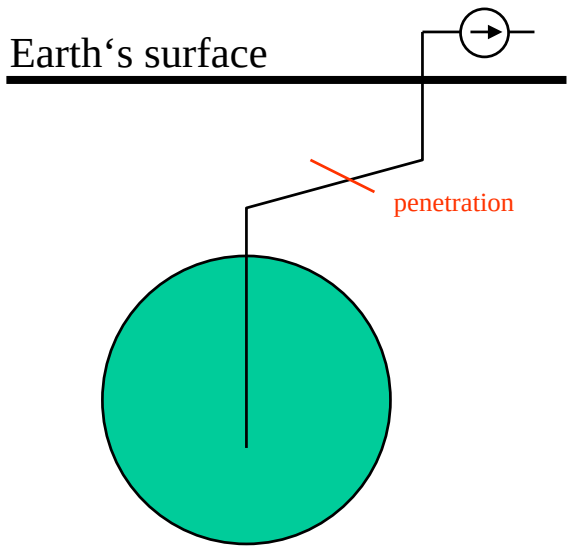
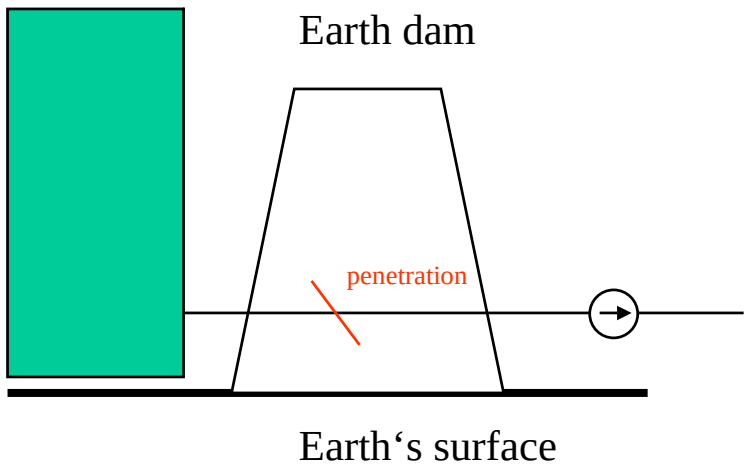
Suction pipes



correct



wrong

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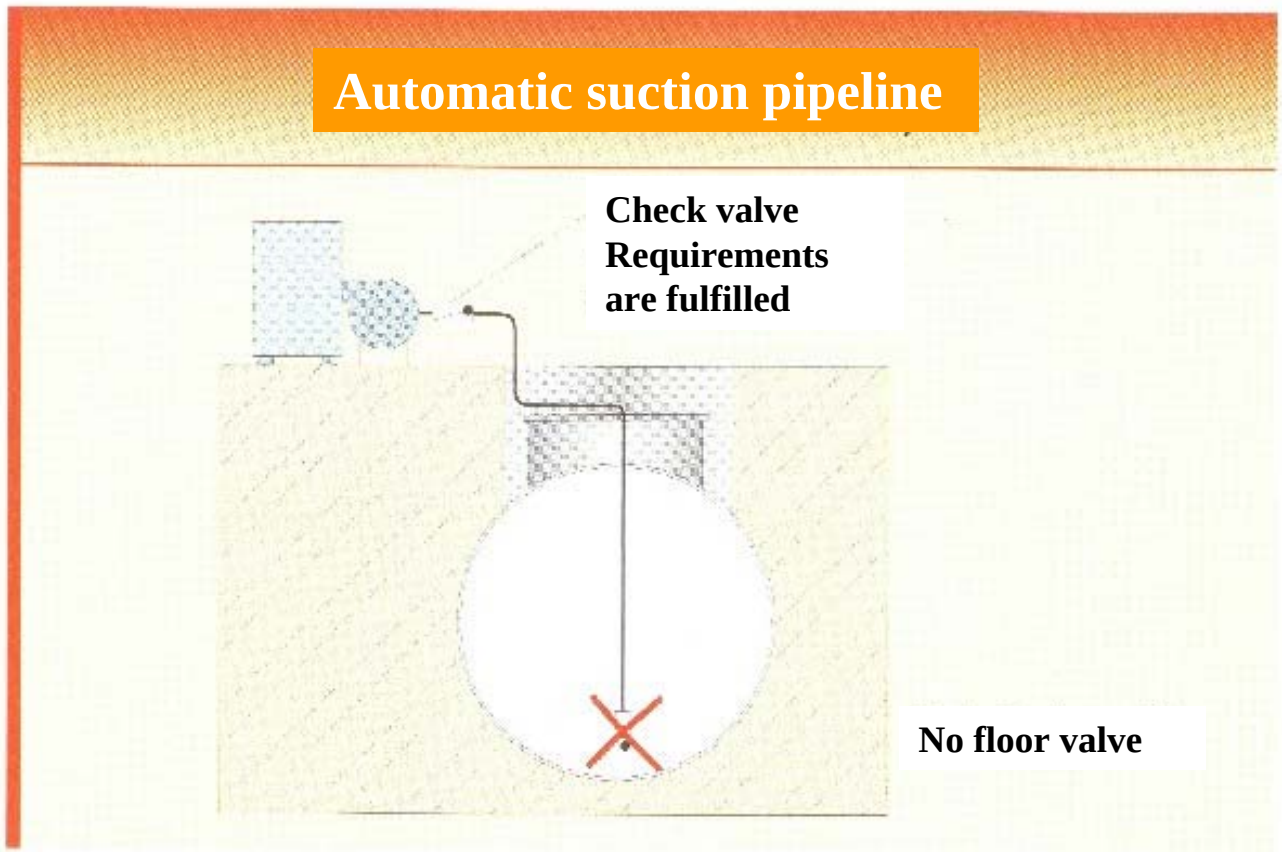
- **Suction pipes (self-protected)**



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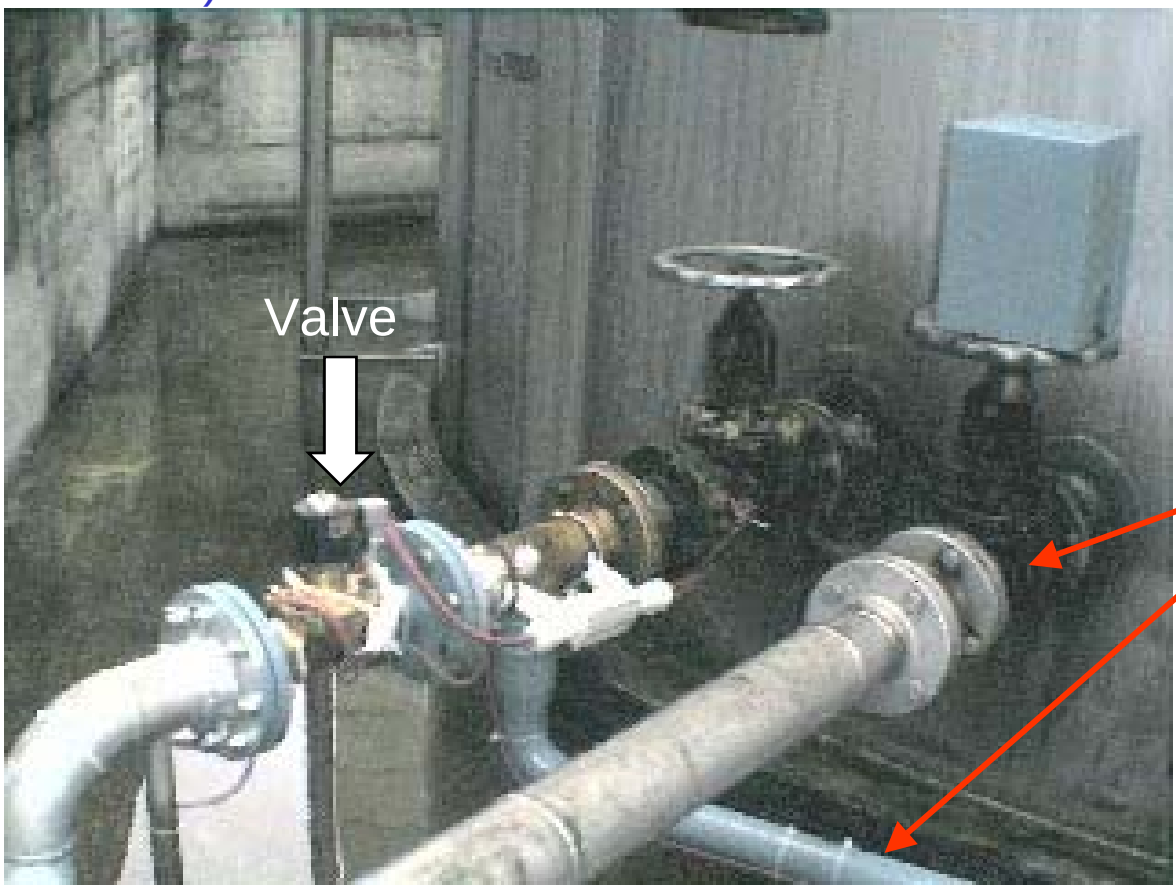
Suction pipe protected by an electric valve (protection against being siphoned out)



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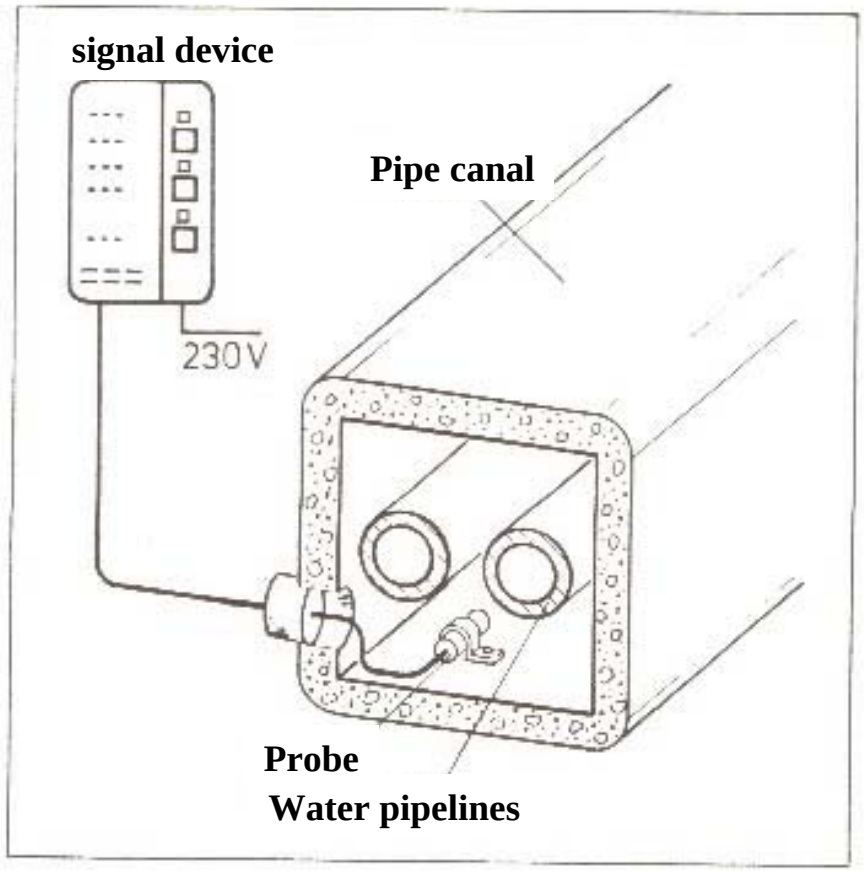
Under-ground pipelines encased in a duct/protective tube



Duct/protective tube with leakage monitoring by means of a leakage indicator (alarm)

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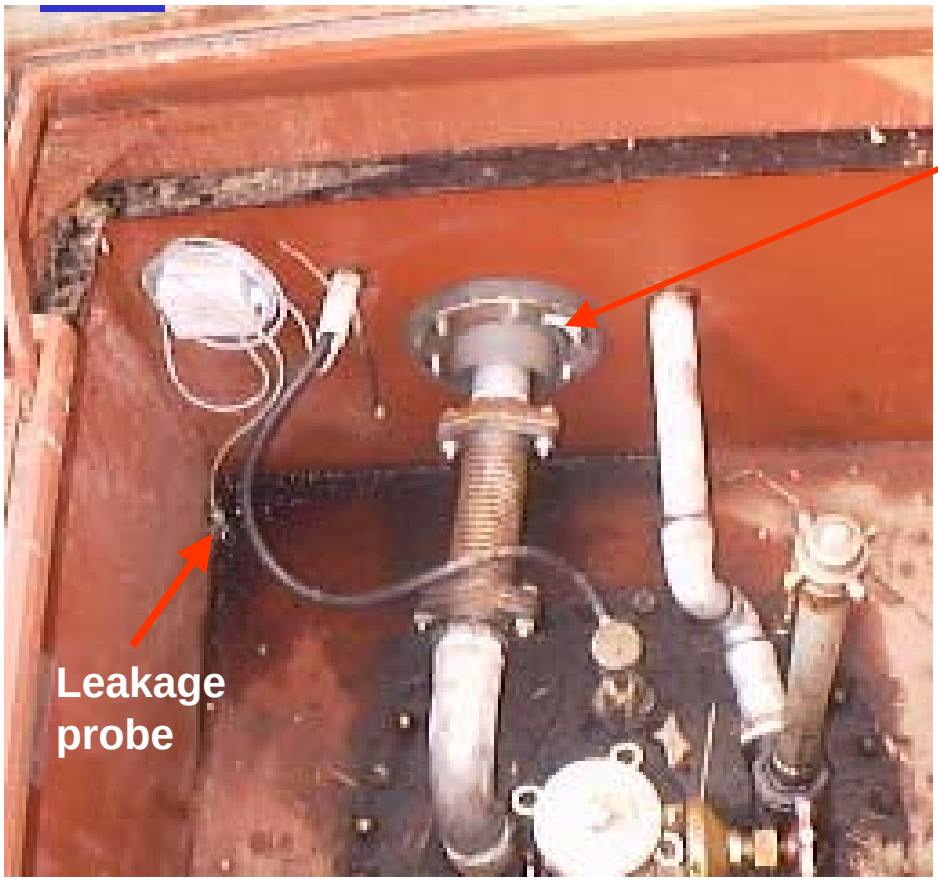
Example of under-ground pipelines encased in a duct/protective tube



Protective tube with leakage monitoring by means of a leakage probe and leakage alarm

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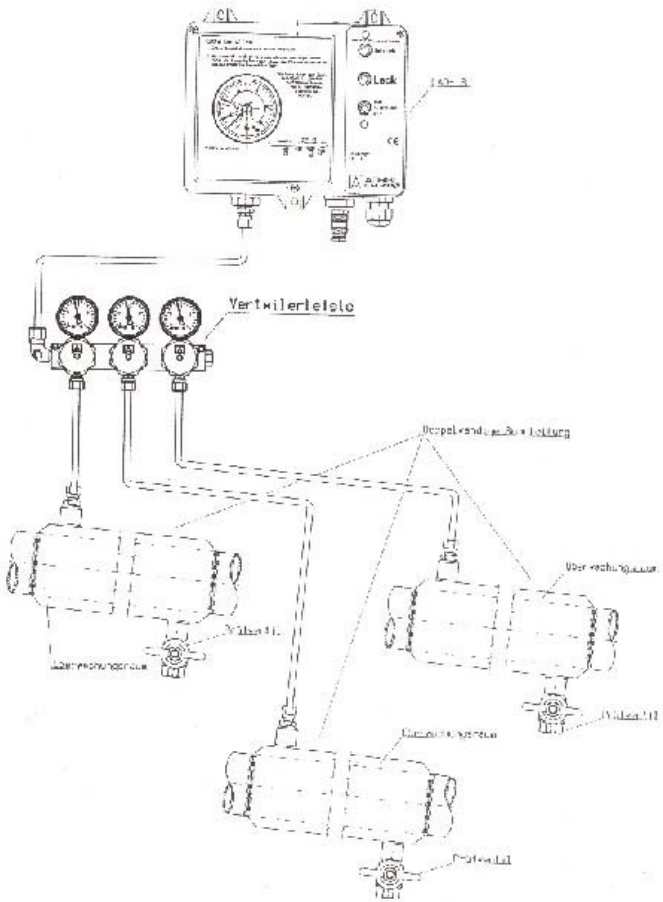
Under-ground double shell pipeline



Double shell pipeline with LAG (Leakage indicator) working on the principle of overpressure,
⇨ for flammable liquids hazardous to water, the control chamber is filled with an inert gas (e.g. N_2) !

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Example of double shell pipelines

Double shell pipeline with LAG (Leakage indicator) working on the principle of overpressure

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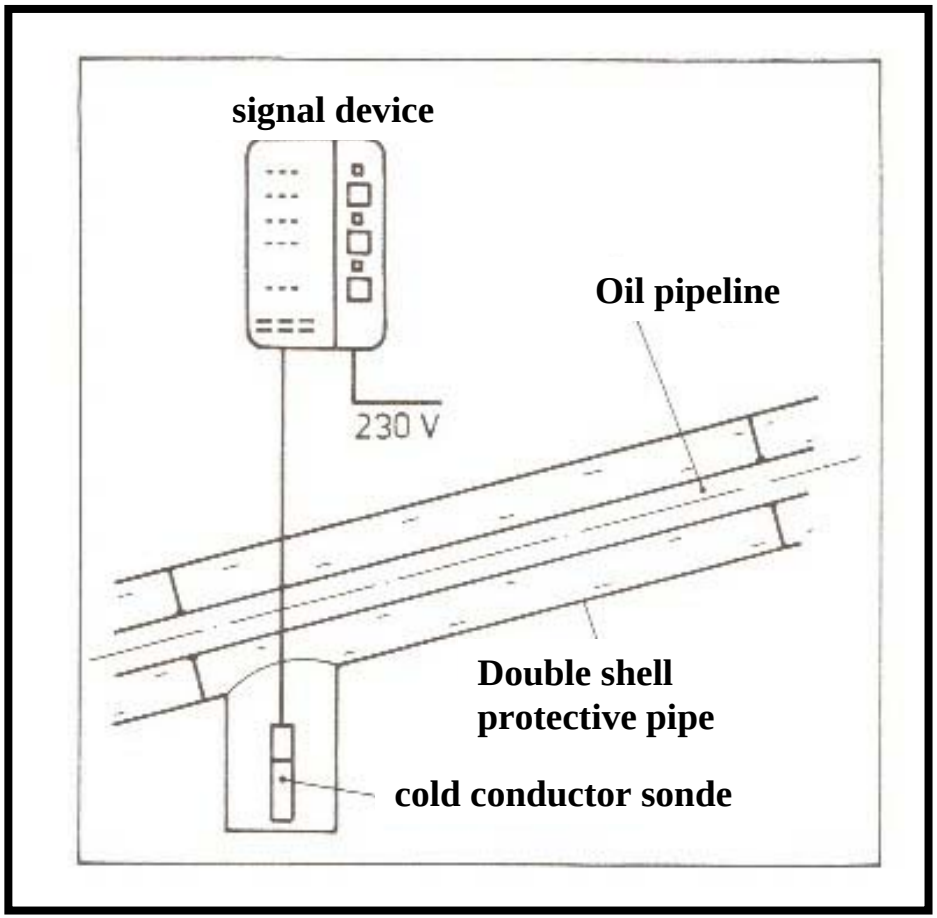
Under-ground double shell pipeline/ with protective tube



Double shell pipeline/ encased in a protective tube with leakage indicator in a controlled chamber

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- **Requirements on protective tube**
  - **mechanical durability**
    - **Load as a result of compressed soil coverings**
    - **Load as a result of passage of vehicles and people**
  - **Resistant to corrosion**
  - **durable**
  - **Resistant to the medium**

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Other ICPE recommendations

- The position and course of Pipelines should be known and documented
- Conception, mounting or installation, checks, maintenance and alteration of pipelines must be executed by experts and has to be documented.
- Pipelines should be properly labelled

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Example of pipeline diagram