

High Walled Dikes

**Secondary Containment for
Aboveground Hydrocarbon Tanks**

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Secondary Containment

Significance:

- Low pressure tanks, per API 650 or API 620 are often used for storing Hydrocarbons
- Any Loss of Primary Containment poses significant risk of fires, injuries, toxic exposures and environmental damage
- Adequate secondary containment is extremely important mitigation and is required by regulations
- Secondary containment acts as a passive protection i.e. does not rely on human or instrumented interventions

Common options for Secondary containment of aboveground tanks

- Regular common diking around multiple tanks
- Sloping with a remote impoundment
- **High walled Steel or Concrete dikes**

**Not Double
walled tanks**

Alternatives for Secondary Containment



Tanks exposed to pool
fire risk and Fire event
can spread and
escalate

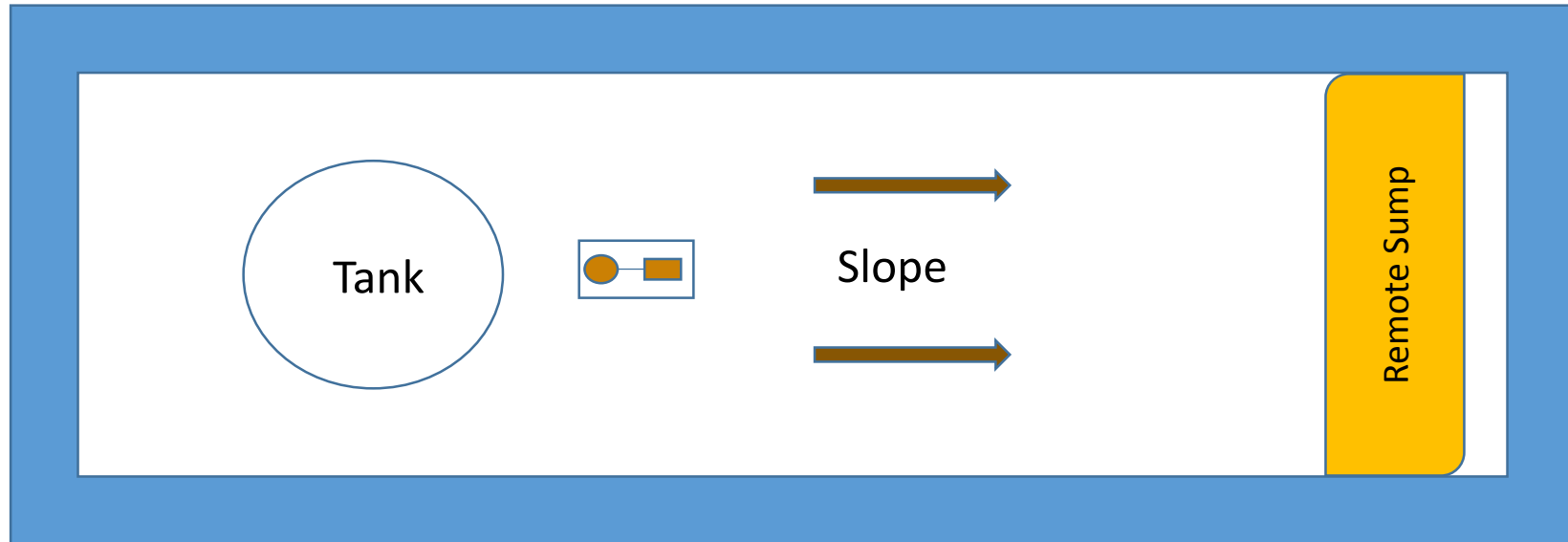
Regular Dikes

Alternatives for Secondary Containment



Double walled tanks in regular Dikes

Alternatives for Secondary Containment



Remote Impoundment

Alternatives for Secondary Containment



High Walled Concrete Dike

Brief Description of Technology

- High walled dike design makes use of a wall around the tank going to the same height as tank forming an annular space
- Concrete Dike serves as full spill containment volume for the tank
- The annular ring space between the dike and tank is left open from the top
- Liquid leak detection and gas detection in the annular space
- Effective Fire protection strategy such as deluge skid to inject foam in the annular space

Benefits: High Walled Dikes

❖ Better Secondary Containment

- Leak contained regardless of height and trajectory of leak
- Leak contained from direct tank outlet valves/flanges (compared to double walled tanks)

❖ Fire Protection benefits

- Reliable gas and leak detection within confined space helps fire prevention and mitigation
- Smaller surface area allows quick snuffing of fire using foam injection

Benefits: High Walled Dikes

Smaller vapor cloud reduces risk from fire and toxicity

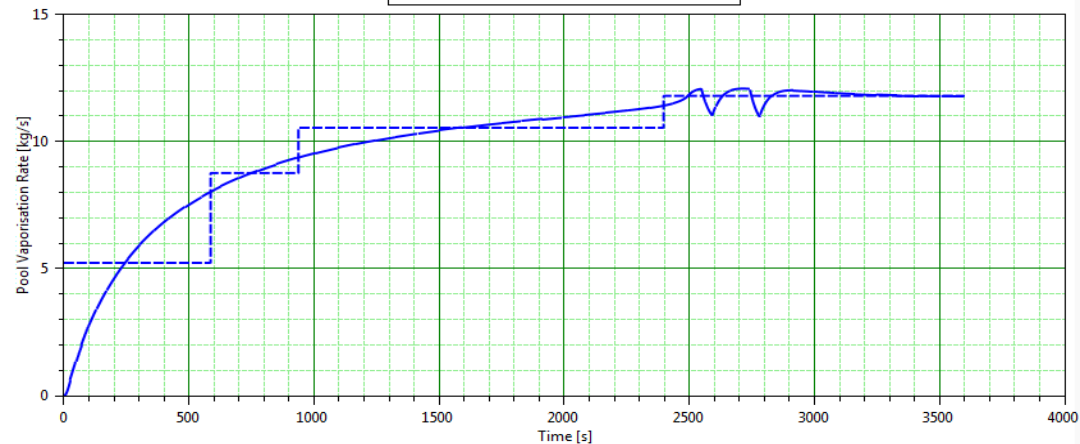
- Annular space significantly reduces the surface area available for vaporization
- Vapor cloud (toxicity or flammable) footprint is significantly smaller
- Release point for vapors is from top of the dike helping dispersion
- Foam injection further dampens vaporization

Comparison of vaporization rates after liquid leak

No bund

Pool Vaporisation Rate vs Time
Leak

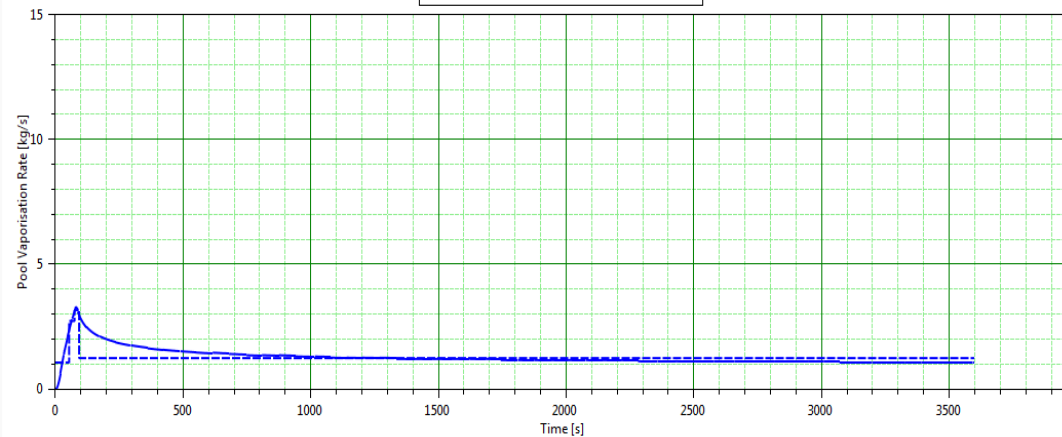
— Category 3/D — Category 3/D (Average)



High Walled Dike

Pool Vaporisation Rate vs Time
Leak

— Category 3/D — Category 3/D (Average)



High Walled Dikes Benefits

Capital cost and Operating costs

- Smaller foot print reduces real estate needs especially for concrete
- Minimizes foam and fire water requirements and hence foam equipment sizing
- Smaller annular area means reduced rain water collection and drainage needs
- Dike wall protects tank wall from elements and reduces vapor loss caused by radiant heating

Additional Fire Protection Benefits for **Concrete** wall option

- Concrete wall acts as a fire wall minimizing risk of domino effects (cascading fires and impact to surrounding property)
- Concrete wall protects the tank from surrounding pool fires, including its pump area (higher likelihood)
- Concrete wall reduces risk to personnel from direct exposure
- Concrete wall eliminates need for directional spray on tank walls
- Minimizes equipment damage in case of fire

High Walled Dikes Disadvantages

- Accessibility around tank is challenged. Confined Space entry needed for any repair or inspection work within annular space
- Level build up in annular space can create risk of buoyancy or damage the tank walls if internal level also is low
- Design not as easy to install as traditional dikes

<p>These risks can be effectively managed</p>
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High Walled Dikes offer
overall EH&S Risk reduction
at reduced costs