Storage Tanks

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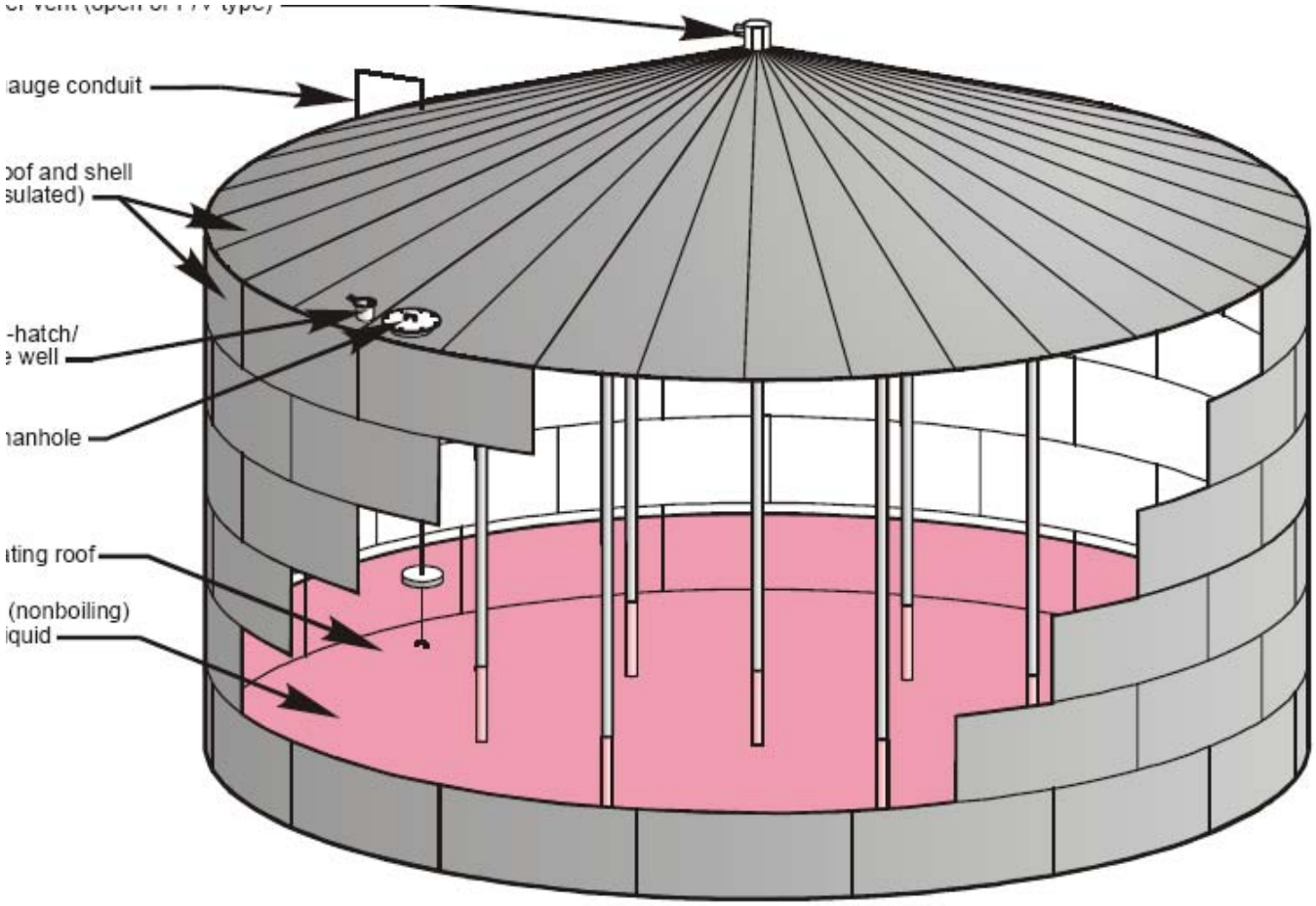
Overview (27 slides)

- Tank Types
- Emission Mechanisms
  - Normal Operations
  - Roof Landings
  - Tank Cleanings
- Controls
  - Physical Controls
  - Operational Controls

Tank Types

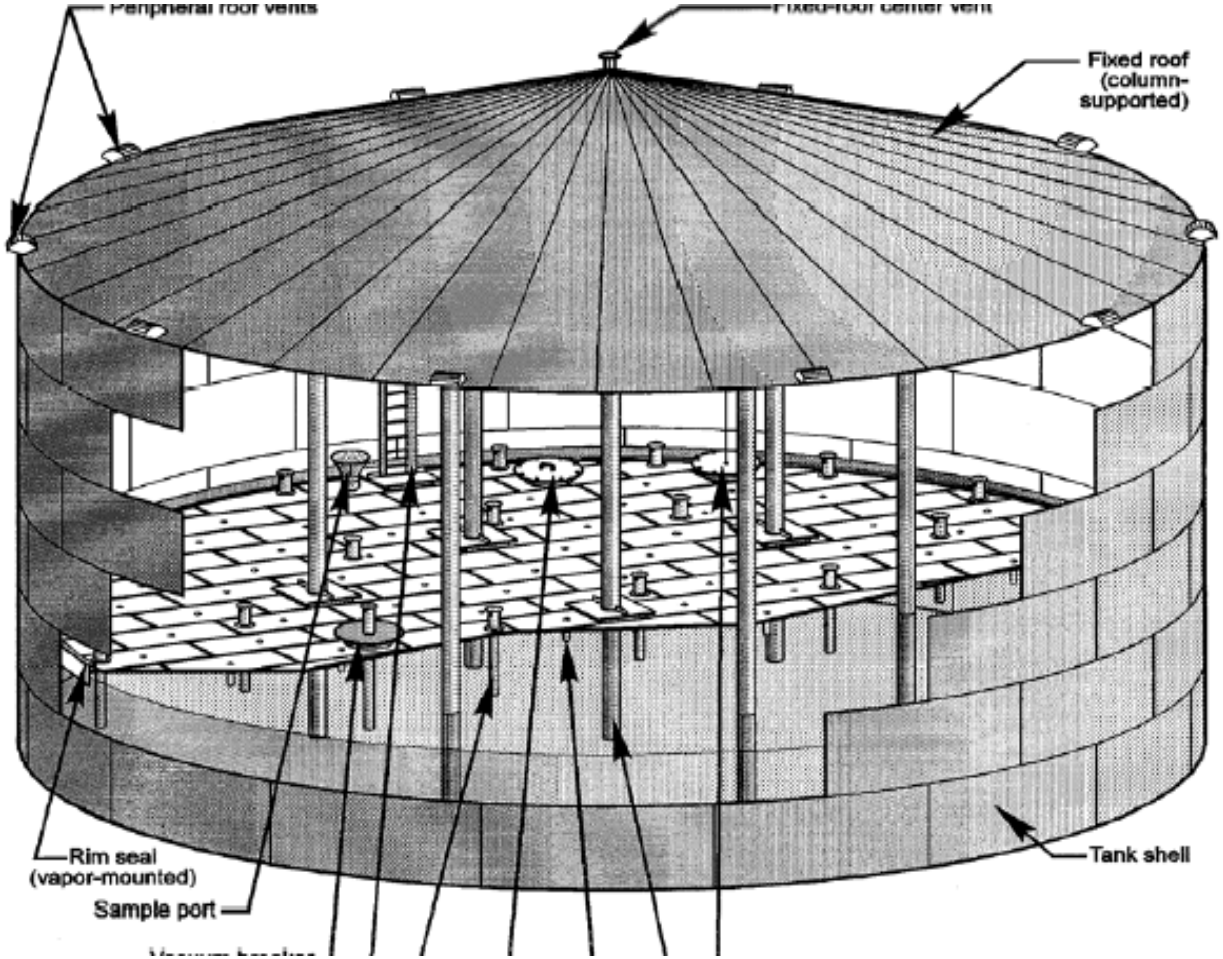
Fixed Roof Tanks



Fixed Roof Tanks

- Horizontal Fixed Roof Tanks
- Vertical Fixed Roof Tanks

Floating Roof Tanks



Floating Roof Tanks

- External Floating Roof Tanks
- Internal Floating Roof Tanks
- Domed External Floating Roof Tanks

Emissions Mechanisms

- Normal Operations
- Floating Roof Landings
- Tank Cleaning Activities

Normal Operations

- When product is stored inside the tank

- Is not when a tank is landed (floaters only)
- Is not when the tank is clean and empty

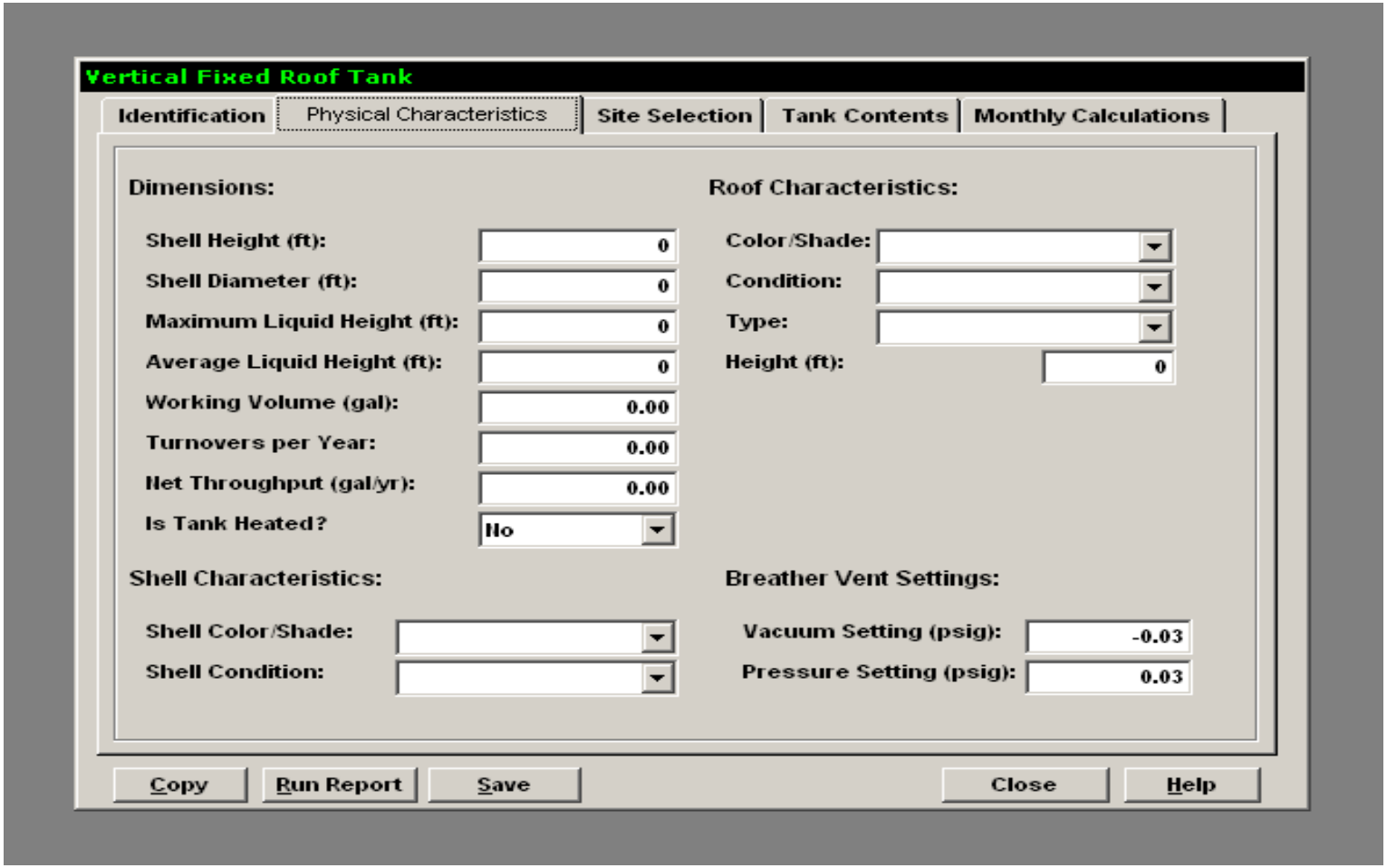
Normal Operations

- Emissions during normal operations result from:
  - Working losses
  - Breathing losses:
    - Deck seam losses
    - Rim seal losses
    - Fitting losses
  - Can be modeled using the EPA's TANKS program version 4.09d

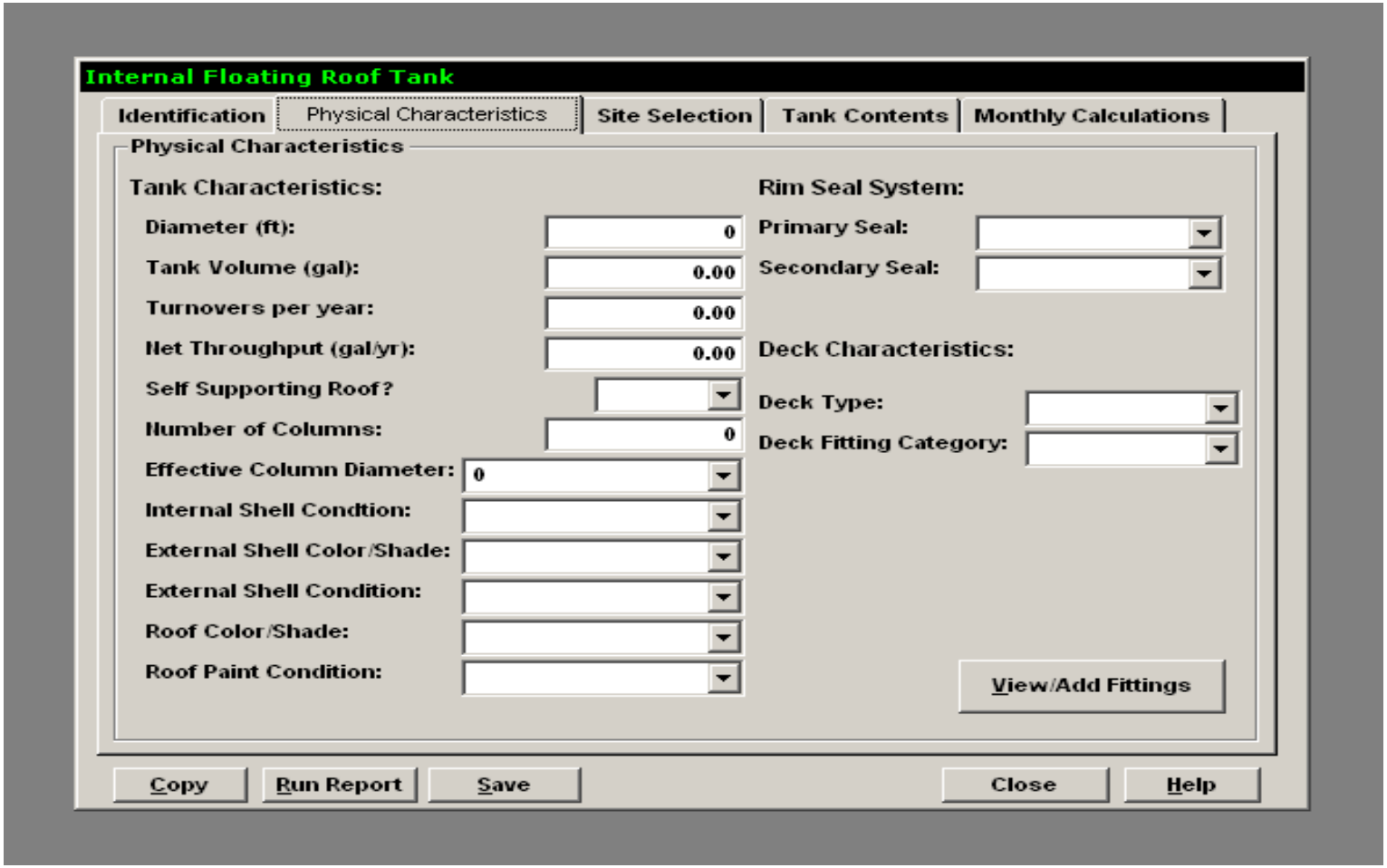
Normal Operations – Data Needs

- Type of Tank
- Dimensions, Capacity, Other Physical Attributes of the Tank
- Contents
- Throughput

Normal Operations: Data Needs for VFRT



Normal Operations: Data Needs for IFRT



Tank Landings

- Occur when the liquid level becomes low enough that the floating roof lands on its legs at which point breather vents are activated to equalize pressure
- Calculated using methodologies in API 2567 (Evaporative Losses from Storage Tank Floating Roof Landings, April 2005) and EPA's AP-42, 7.1 (Organic Liquid Storage Tanks, November 2006)
- Sum of standing idle losses and filling losses

Tank Landings – Data Needs

- Emission calculations are based on tank type and whether a heel is present upon landing

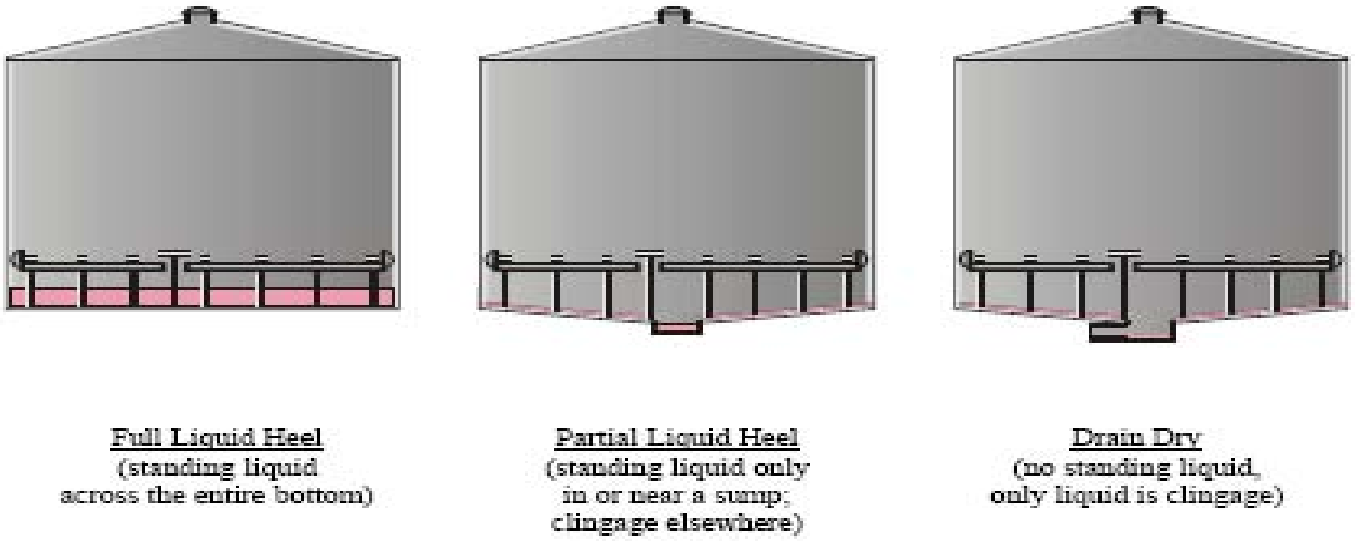


Figure 7.1-20. Bottom conditions for landing loss.[20]

Tank Landings – Data Needs

- Physical conditions during landings:
  - Height of liquid in tank
  - Volume of vapor space below landed roof
- Contents being removed, contents being introduced
- Number of days standing idle

Tank Cleanings

- Tank Cleanings occur when a tank is landed, degassed (vapor space purge), sludge is removed, and the tank is refilled
- Emission calculations calculated based on methodologies in API 2568 (Evaporative Loss from Cleaning of Storage Tanks, Nov 2007)

Tank Cleanings

- Also applies to fixed roof tanks
- Emissions vary by tank type and heel type (drain dry, partial heel, or full heel)
- Emissions are affected by the process that a company uses

Tank Cleanings – Data Needs

- Tank type
- Heel type
- Process used (timing of events)
- Height/Volume of vapor space
- Slope of tank bottom
- Ventilation rates
- LEL readings

Controls to Reduce Emissions

- Physical Controls
- Operational Controls

Physical Controls

- Install floating roof (deck) on fixed roof tanks
- Dome external floating roof tanks
- Weld decks
- Socks on legs
- Wipers, floats, and/or sleeves on guide/gauge poles

Physical Controls

- Reduce leg heights or replace legs with cable suspended roofs
- Equip with new or better primary and secondary seals
- Combustion and recovery devices

Physical Controls

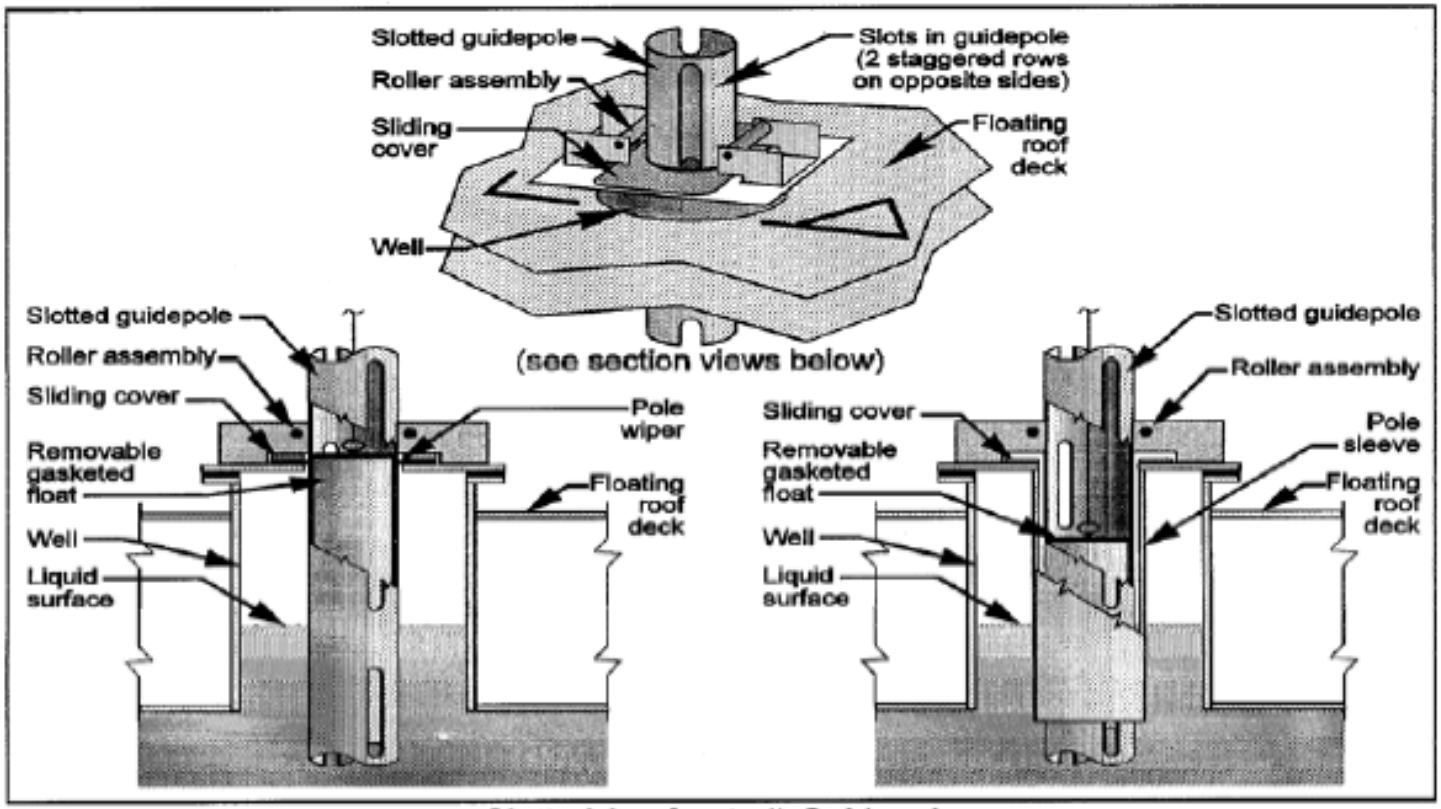


Figure 7.1-11. Slotted and unslotted guidepoles.[20]

Physical Controls

Table 7.1-12. DECK-FITTING LOSS FACTORS, K_{Fa}, K_{Fb}, AND m, AND TYPICAL NUMBER OF DECK FITTINGS, N_F[a]

Fitting Type And Construction Details	Loss Factors		
	K_{Fa} (lb-mole/yr)	K_{Fb} (lb-mole/(mph)^m-yr)	m (dimensionless)
Access hatch (24-inch diameter well)			
Bolted cover, gasketed[b]	1.6	0	0
Unbolted cover, ungasketed	36[c]	5.9	1.2
Unbolted cover, gasketed	31	5.2	1.3
Fixed roof support column well[d]			
Round pipe, ungasketed sliding cover	31		
Round pipe, gasketed sliding cover	25		
Round pipe, flexible fabric sleeve seal	10		
Built-up column, ungasketed sliding cover[e]	51		
Built-up column, gasketed sliding cover	33		
Unslotted guide-pole and well (8-inch diameter unslotted pole, 21-inch diameter well)			
Ungasketed sliding cover[b]	31	130	1.4
Ungasketed sliding cover w/pole sleeveGasketed sliding cover	25	2.2	2.1
Gasketed sliding cover w/pole wiper	23	13	2.2
Gasketed sliding cover w/pole sleeve	14	3.7	0.78
	8.6	12	0.81
Slotted guide-pole/sample well (8-inch diameter slotted pole, 21-inch diameter well)[f]			
Ungasketed or gasketed sliding cover	43	270	1.4
Ungasketed or gasketed sliding cover, with float[g]	31	36	2.0
Gasketed sliding cover, with pole wiper	41	48	1.4
Gasketed sliding cover, with pole sleeve	11	46	1.4
Gasketed sliding cover, with pole sleeve and pole wiper	8.3	4.4	1.6
Gasketed sliding cover, with float and pole wiper[g]	21	7.9	1.8
Gasketed sliding cover, with float, pole sleeve, and pole wiper[h]	11	9.9	0.89

Operational Controls

- Avoid or reduce the number of landings per year
- Reduce the number of cleanings per year
- Minimize the time that the tank stands idle (time between landing and degassing or landing and refilling)
- Always drain product completely when landing (if drain dry conditions are possible)

Operational Controls

- During tank cleanings, run ventilation fans continuously to avoid vapor build-up and subsequent vapor space purges

Thanks For Staying Awake!

- Questions?