7/28/81
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J. Kane

Borated Water Storage Tanks – Design Details

- Tanks are 52' in ⌀ and 32' high and are stainless steel tanks.
- Tanks rest on compacted granular backfill WITHIN a RC ring wall.
- Valve pit is integral with ring wall
- Bottom plate of tank was installed to slope 1/8"/ft ($\frac{1}{8}$" $\wedge \frac{52 ft}{2} = \frac{6.5"}{2}$) or $\frac{6.5"}{2} = 3.25"$ from center of tank downward to ring wall

CPCo Position on Cause of Cracking (Refer to ~~Jan.~~ Feb. 20, 1981 letter from J. Cook to J. Keppler)

- During load testing of tank (Oct. 1980), CPCo noted discrepancy between settlement values being measured and computed displacement (original structural analysis).
- CPCo made reanalysis (finite element) with varying values of modulus of elasticity (E) of the soils. This reanalysis predicted greater than allowable moments at several locations on the ring wall on both sides of valve pit.
- CPCo excavated trenches @ predicted locations of high moment and found crack (high reinforcement strain). Largest crack 0.063 inch @ Unit 1 and 0.035 inch @ Unit 2.
- Tank has trapezoidal anchor chairs on its periphery which are bolted to ring wall with anchor bolt & nut. During tank loading a gap developed between the bolt nut and anchor chair in certain locations [north and south (valve pit end) ends] along the tank periphery and in other locations the top of the anchor chair was distorted. The anchor bolt behavior (gaps in some locations & distortion of anchor chair at others) is caused by differential settlement between the tank bottom and the ring wall. Where gaps occur the tank bottom has ~~settled~~ settled more than the ring wall. Where distortion of the top of anchor chair occurs, the ring wall has settled more than the tank bottom.

- (JDK understanding) Since the gaps appear @ the valve pit side, it implies the tank has settled more than the ring wall which is an intergral part with the valve pit where loading is distributed over a wider area at lower bearing pressures.
- This also implies that the ring wall settled the most on the east & west sides of the tank away from the valve pit
- Although cracked the ring wall is, stated by CPCo, to be capable of providing required dead load anchorage and CONFINEMENT of the tank foundation support material through Hoop Tension.
- Stainless steel tank is ductile & capable of redistributing loads because of deformation
- Corrosion (due to groundwater & atmosphere) of reinforcing steel in ring wall ALONG WITH CONTINUING to OPEN CRACK WIDTHS is a concern but not an immediate safety problem

pg. 2 CPCo - Probable Cause

When tank was loaded - the bearing pressure under tank was increased by 2KSF over pressure of beneath the valve pit. The 2KSF differential bearing pressure was not accounted for in ring beam reinforcing design. As a consequence the valve pit restrained tank foundation from settling uniformly which caused bending at the ring wall/valve pit junction. (This implies that the ring wall foundation was also under greater bearing pressure because of increased tank loading)

Future Actions (Also refer to NCAR 48, Interim Rpt. 3, May 29, 1981)

1. Surcharge valve pit to reduce cracks & reduce bending moments & reduce future settlement, reduce tank shell deformation
2. Reinforce (actually decided to build new separate ring) ring foundation.