Final head of water after cross-flooding:

$$h_f = 1.5m$$

$$T_f = \frac{2 \cdot 365m^3}{0.12m^2 \cdot 0.54} \cdot \frac{1}{\sqrt{2 \cdot 9.81 m/s^2 \cdot 5.3m}} \cdot \frac{1}{\left(1+\sqrt{\frac{1.5m}{5.3m}}\right)}$$

$$T_f = 721s$$

Calculation of any transient situation of cross-flooding:

The purpose is to find the situation after 600s.

Assumed transient situation:

Cross-flooded volume: 265 $m^3$

Volume of water which is used to bring the vessel from the transient situation to the final equilibrium : $W_\theta$ = 365 $m^3$ – 265 $m^3$ = 100 $m^3$

Corresponding head of water: $H_\theta$ = 2.8 m

Time required to bring the vessel from any transient situation to the final equilibrium condition:

$$T_\theta = \frac{2W_\theta}{S \cdot F} \cdot \frac{1}{\sqrt{2gH_\theta}} \cdot \frac{1}{\left(1+\sqrt{\frac{h_f}{H_\theta}}\right)}$$

$$T_\theta = \frac{2 \cdot 100m^3}{0.12m^2 \cdot 0.54} \cdot \frac{1}{\sqrt{2 \cdot 9.81 m/s^2 \cdot 2.8m}} \cdot \frac{1}{\left(1+\sqrt{\frac{1.5m}{2.8m}}\right)}$$

$T_\theta$ = 240 s

Time between commencement of cross-flooding and assumed transient situation:

$T = T_f - T_\theta$ = 721 s – 240 s = 481 s

As $T$ is less than 600 s, further transient situations with larger cross-flooded volume may be calculated in the same way.

On the reverse, if $T$ was of more than 600 s, further transient situation with smaller cross-flooded volume may be calculated.

Situation after 600 s may be found by successive iterations.

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