# Appendix D Example 7 – Stability of Shoring Towers

Refer to *Falsework (FW) Manual*, Section 6-6, *Tower Stability*. This example demonstrates how to check the stability of shoring towers.

## Given Information

Wind load calculated in example 5:

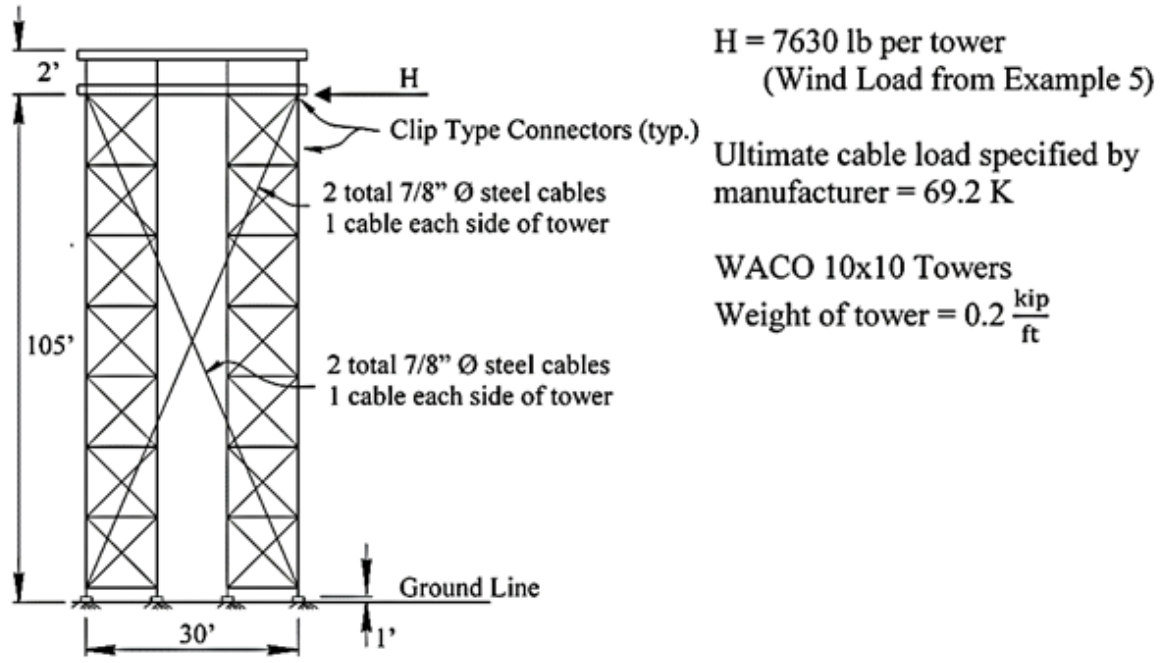



**Figure D-7-1. Wind Load on Towers**

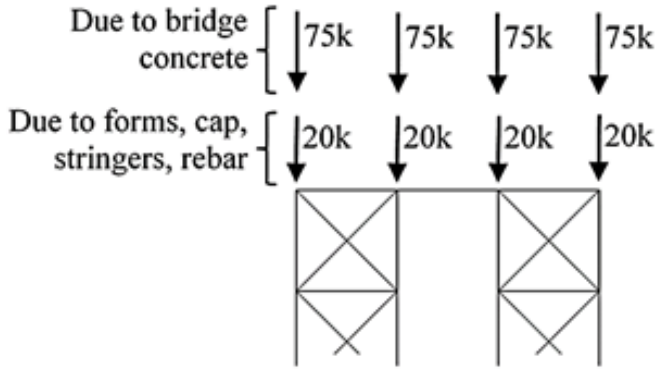



**Figure D-7-2. Tower Reactions**

## Check Stability

## Check Stability of the Unloaded Towers

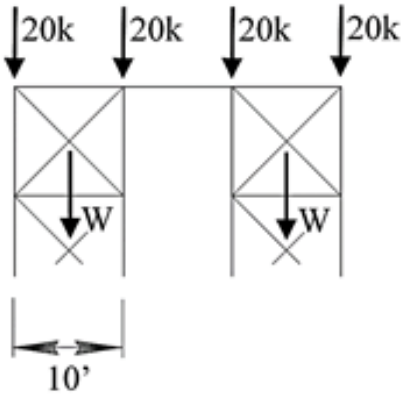



**Figure D-7-3. Unloaded Towers**

1. Calculate the resisting moment (RM) before the bridge concrete is placed:

   Tower weight W = 0.2 $\frac{\text{kip}}{\text{ft}}$ $(104\text{ ft}) = 20.8\text{ kip}$

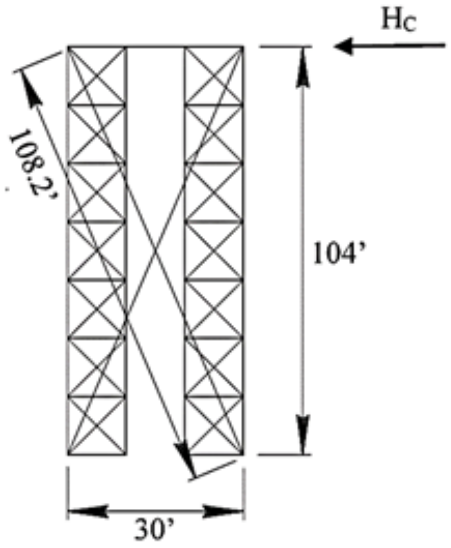
   RM per tower = 10 ft (20 k) + 5 ft (20.8 k) = $304^{\text{ft}-\text{k}}$

2. Overturning moment (OTM) = 104 ft (7630 lb/1000) = $794^{\text{ft}-\text{k}}$

3. Since OTM = $794^{\text{ft}-\text{k}} > \text{RM} = 304^{\text{ ft}-\text{k}}$

   Cable bracing is required for unloaded condition.

4. Calculate the force in the cables.




Excess overturning, one tower = $794^{\text{ft}-\text{k}} - 304^{\text{ft}-\text{k}} = 490^{\text{ft}-\text{k}}$

Excess overturning, two towers = $2(490^{\text{ft}-\text{k}}) = 980^{\text{ft}-\text{k}}$

$H_C = \frac{980^{\text{ft}-\text{k}}}{104\text{ft}} = 9.42$ kip

Force in cables T = $\frac{108.2\text{ ft}}{30\text{ ft}}$ (9.42 kip) = 34.0 kip

**Figure D-7-4. Towers and Cable Bracing**

5. Check cables:

Efficiency of clip type connectors = 80% (FW Sect. 5-5.04)
Factor of safety = 3.0 (FW Sect. 5-5.06)

Ultimate cable load = 69.2 kip (given)

Safe working load –

$$\frac{\text{Breaking strength x connector efficiency}}{\text{safety factor}} = \frac{69.2\text{ kip}\,(0.80)}{3.0} = 18.5\text{ kip}$$

$$18.5\ \frac{\text{kip}}{\text{cable}}\ \text{x}\ 2\ \text{cables} = 37.0\text{ kip}$$

34.0 kip ≤ 37.0 kip allowable

Check Stability of the Loaded Towers

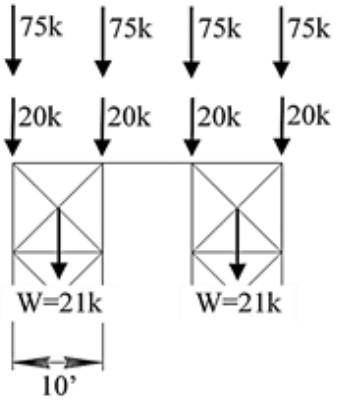



**Figure D-7-5. Loaded Towers**

1. Calculate the resisting moment after the bridge concrete is placed.
   RM of two tower units = 2 [5ft (21 kip)+ 10 ft (95 kip)] = $2110^{\text{ft}-\text{k}}$
2. OTM of two tower units = 2 x $794^{\text{ft}-\text{k}}$ = $1588^{\text{ft}-\text{k}}$
3. Since OTM =$1588^{\text{ft}-\text{k}}$ **≤** RM = $2110^{\text{ft}-\text{k}}$

   Cable bracing is not required for loaded condition