Appendix D Example 8 – Stability of Towers with Discontinuous Legs

Refer to *Falsework Manual,* Section 6, *Stability* and Section 6-6, *Tower Stability*. This example problem illustrates the overturning stability of a tower with discontinuous legs. Refer to Figure D-8-1.

Given Information

Assume that the bracing and other falsework features are adequate:

P_1 = 6,700 lb

P_2 = 7,000 lb

γ_ω = weight of wood = 35 pcf

H = 1,050 lb acting on one-half of a tower unit.

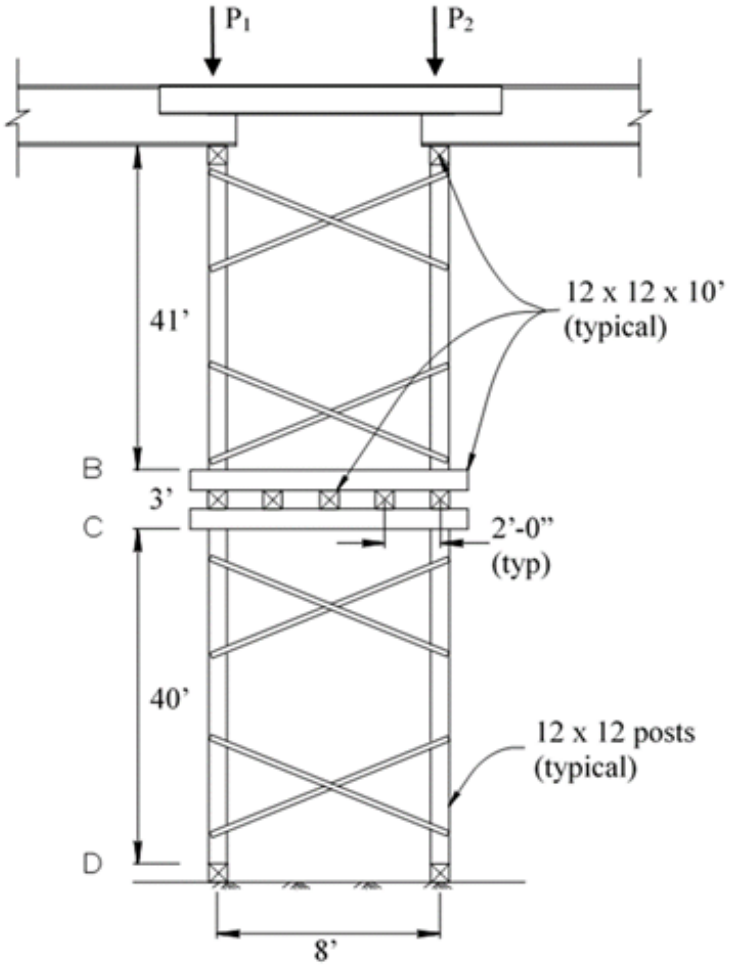

Figure D-8-1. Tower with Discontinuous Legs

Check Shear Resistance

The shear at the elevation of the plane B discontinuity will govern since frictional resistance increases with the weight of additional material below that elevation.

Check shear resistance at plane B. The active horizontal load (H) of 1,050 lb will be resisted by the frictional capacity of 2 tower legs.

Single post weight = 40 ft $(1\ \text{ft}^2)$(35pcf) = 1,400 lb

Single cap weight = 10 ft $(1\ \text{ft}^2)$(35pcf) = 350 lb

Resistance = 0.3[6,700 lb + 7,000 lb+ 2(1,400 lb) + $2\left(\frac{350\ \text{lb}}{2}\right)$] = 5,055 lb > 1,050 lb

Mechanical connection not required

Check Overturning Resistance

Check overturning resistance at plane B, C, and D by taking moments about the heavier loaded post.

Plane B:

OTM = 41 ft(H) = 41 ft(1,050 lb) = $43{,}050^{\text{ft}-\text{lb}}$

RM = 8ft (6,700 lb) + 8ft (1,400 lb) + 8 ft($\frac{350\text{ lb}}{2}$) = $66{,}200^{\text{ft}-\text{lb}}$

Safety Factor = $\frac{66{,}200}{43{,}050}$ = 1.54

External bracing not required

Plane C:

OTM = 44 ft(H) = 44 ft(1,050 lb) = $46{,}200^{\text{ft}-\text{lb}}$

RM = $66{,}200^{\text{ft}-\text{lb}}$ + 2(4 ft)(350 lb) + ($\frac{350\text{ lb}}{2}$)(2 ft + 4 ft + 6 ft + 8 ft) = $72{,}500^{\text{ft}-\text{lb}}$

Safety Factor = $\frac{72{,}500}{46{,}200}$ = 1.57

External bracing not required

Plane D:

OTM = 84 ft(H) = 84 ft(1,050 lb) = $88{,}200^{\text{ft}-\text{lb}}$

RM = $72{,}500^{\text{ft}-\text{lb}}$ + 8ft (1,400 lb)) = $83{,}700^{\text{ft}-\text{lb}}$

Safety Factor = $\frac{83{,}700}{88{,}200}$ = 0.95 **<** 1

External bracing will be required to prevent overturning!