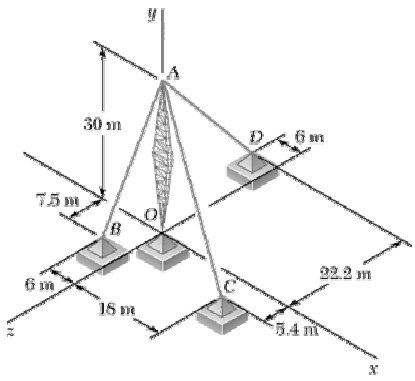
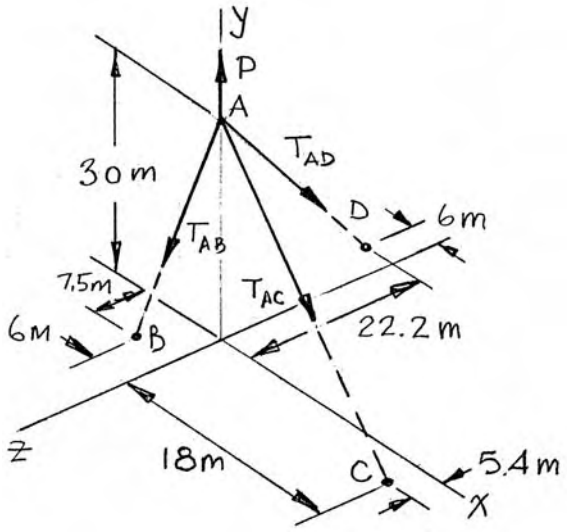
PROBLEM 2.116



A transmission tower is held by three guy wires attached to a pin at *A* and anchored by bolts at *B*, *C*, and *D*. Knowing that the tower exerts on the pin at *A* an upward vertical force of 8 kN, determine the tension in each wire.

SOLUTION



From the solutions of 2.111 and 2.112:

$$T_{AB} = 0.5409P$$

$$T_{AC} = 0.295P$$

$$T_{AD} = 0.2959P$$

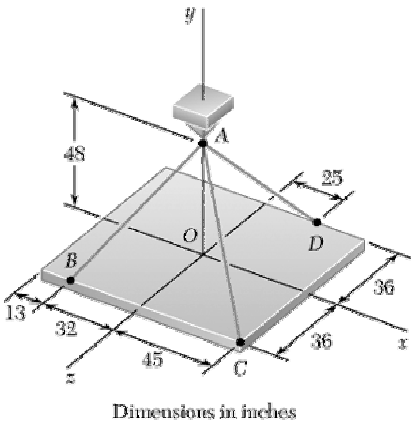
Using $P = 8$ kN:

$$T_{AB} = 4.33 \text{ kN} \blacktriangleleft$$

$$T_{AC} = 2.36 \text{ kN} \blacktriangleleft$$

$$T_{AD} = 2.37 \text{ kN} \blacktriangleleft$$

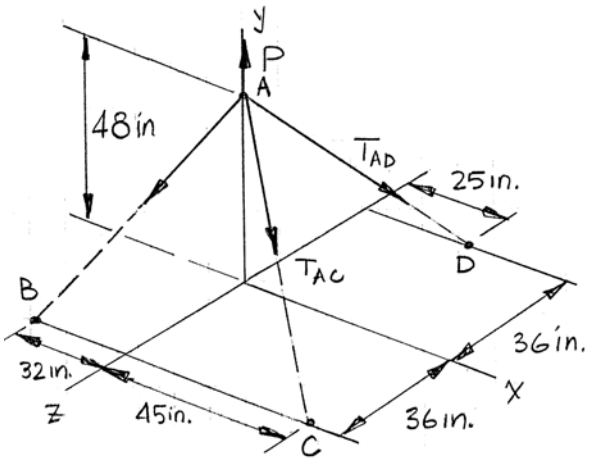
PROBLEM 2.117



Dimensions in inches

For the rectangular plate of Problems 2.113 and 2.114, determine the tension in each of the three cables knowing that the weight of the plate is 180 lb.

SOLUTION



From the solutions of 2.113 and 2.114:

$$T_{AB} = 0.6440P$$

$$T_{AC} = 0.0709P$$

$$T_{AD} = 0.6771P$$

Using $P = 180$ lb:

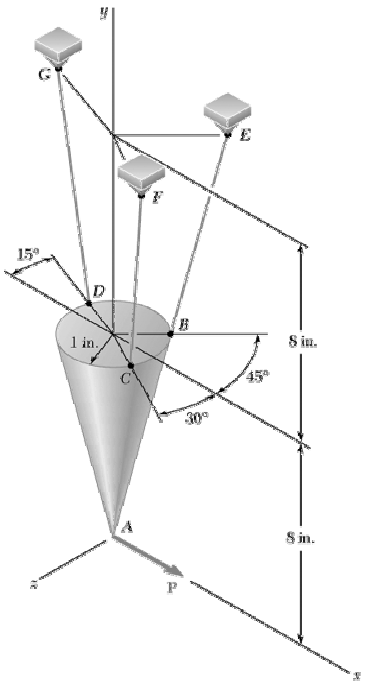
$T_{AB} = 115.9$ lb ◀

$T_{AC} = 12.76$ lb ◀

$T_{AD} = 121.9$ lb ◀

PROBLEM 2.118

For the cone of Problem 2.110, determine the range of values of P for which cord DG is taut if **P** is directed in the $-x$ direction.



SOLUTION

From the solutions to Problems 2.109 and 2.110, have

$$T_{BE} + T_{CF} + T_{DG} = 0.2\sqrt{65} \tag{2′}$$

$$-T_{BE}\sin 45° + T_{CF}\sin 30° - T_{DG}\sin 15° = 0 \tag{3}$$

$$T_{BE}\cos 45° + T_{CF}\cos 30° - T_{DG}\cos 15° - P\sqrt{65} = 0 \tag{1′}$$

Applying the method of elimination to obtain a desired result:

Multiplying (2′) by $\sin 45°$ and adding the result to (3):

$$T_{CF}\left(\sin 45° + \sin 30°\right) + T_{DG}\left(\sin 45° - \sin 15°\right) = 0.2\sqrt{65}\sin 45°$$

or

$$T_{CF} = 0.9445 - 0.3714T_{DG} \tag{4}$$

Multiplying (2′) by $\sin 30°$ and subtracting (3) from the result:

$$T_{BE}\left(\sin 30° + \sin 45°\right) + T_{DG}\left(\sin 30° + \sin 15°\right) = 0.2\sqrt{65}\sin 30°$$

or

$$T_{BE} = 0.6679 - 0.6286T_{DG} \tag{5}$$

PROBLEM 2.118 CONTINUED

Substituting (4) and (5) into $(1')$:

$$1.2903 - 1.7321T_{DG} - P\sqrt{65} = 0$$

$$\therefore \quad T_{DG} \text{ is taut for } P < \frac{1.2903}{\sqrt{65}} \text{ lb}$$

or $0 \le P < 0.1600$ lb ◀