

**1-30** The total weight of water carried by each truss is

$$W_T = 1000(9.81)(0.2)(3.6)(2) = 14,126.40 \text{ N}$$

By symmetry (or overall equilibrium) the support reactions at  $A$  and  $F$  are

$$A_y = F = W_T/2 = 7063.20 \text{ N}$$

The weight of water carried by each roof panel is

$$W_p = 1000(9.81)(0.2)(1.2)(2) = 4708.80 \text{ N}$$

and by symmetry (or equilibrium of the panel) half of this load is carried by the pins at each end of the panel

$$B = E = W_p/2 = 2354.40 \text{ N}$$

$$C = D = 2(W_p/2) = 4708.80 \text{ N}$$

$$\sin \theta = 0.8000$$

$$\cos \theta = 0.6000$$

Then, equilibrium of Pin  $B$  gives

$$\rightarrow \Sigma F_x = 0: \quad T_{BC} = 0$$

$$\uparrow \Sigma F_y = 0: \quad -T_{AB} - 2354.40 = 0$$

$$T_{AB} = -2354.40 \text{ N}$$

Pin  $E$ :

$$\rightarrow \Sigma F_x = 0: \quad -T_{DE} = 0$$

$$\uparrow \Sigma F_y = 0: \quad -T_{EF} - 2354.40 = 0$$

$$T_{EF} = -2354.40 \text{ N}$$

Pin  $A$ :

$$\rightarrow \Sigma F_x = 0: \quad T_{AH} + T_{AC} \cos \theta = 0$$

$$T_{AH} = 3531.60 \text{ N}$$

$$\uparrow \Sigma F_y = 0: \quad 7063.20 + (-2354.40) + T_{AC} \sin \theta = 0$$

$$T_{AC} = -5886.00 \text{ N}$$

Pin  $H$ :

$$\rightarrow \Sigma F_x = 0: \quad T_{GH} - (3531.60) = 0$$

$$T_{GH} = 3531.60 \text{ N}$$

$$\uparrow \Sigma F_y = 0: \quad T_{CH} = 0$$

Pin  $C$ :

$$\rightarrow \Sigma F_x = 0: \quad T_{CD} + T_{CG} \cos \theta - (-5886) \cos \theta - (0) = 0$$

$$T_{CD} = -3531.60 \text{ N}$$

$$\uparrow \Sigma F_y = 0: \quad -4708.80 - (-5886) \sin \theta - (0) - T_{CG} \sin \theta = 0$$

$$T_{CG} = 0 \text{ N}$$

Pin  $G$ :

$$\rightarrow \Sigma F_x = 0: \quad T_{FG} - (3531.60) - (0) \cos \theta = 0$$

$$T_{FG} = 3531.60 \text{ N}$$

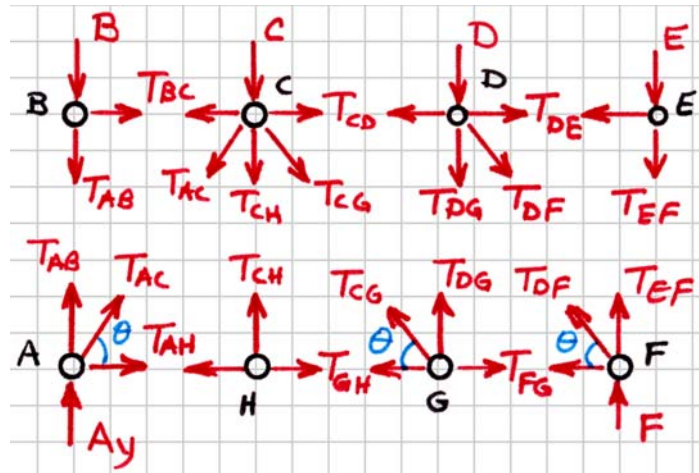
$$\uparrow \Sigma F_y = 0: \quad (0) \sin \theta + T_{DG} = 0$$

$$T_{DG} = 0 \text{ N}$$

Pin  $D$ :

$$\uparrow \Sigma F_y = 0: \quad -4708.80 - (0) - T_{DF} \sin \theta = 0$$

$$T_{DF} = -5886.00 \text{ N}$$



**1-30** (cont.)

The member forces are

<i>AB</i> : 2350 N (C) .....	<i>DE</i> : 0 N .....	<b>Ans.</b>
<i>AC</i> : 5890 N (C) .....	<i>DF</i> : 5890 N (C) .....	<b>Ans.</b>
<i>AH</i> : 3530 N (T) .....	<i>DG</i> : 0 N .....	<b>Ans.</b>
<i>BC</i> : 0 N .....	<i>EF</i> : 2350 N (C) .....	<b>Ans.</b>
<i>CD</i> : 3530 N (C) .....	<i>FG</i> : 3530 N (T) .....	<b>Ans.</b>
<i>CG</i> : 0 N .....	<i>GH</i> : 3530 N (T) .....	<b>Ans.</b>
<i>CH</i> : 0 N .....		<b>Ans.</b>