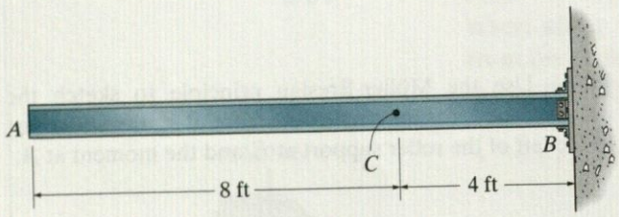
PROBLEMS

Sec. 6.1–6.3

6–1. Draw the influence lines for (a) the moment at C, (b) the vertical reaction at B, and (c) the shear at C. Assume B is a fixed support. Solve this problem using the basic method of Sec. 6.1.

6–2. Solve Prob. 6–1 using the Müller-Breslau principle.

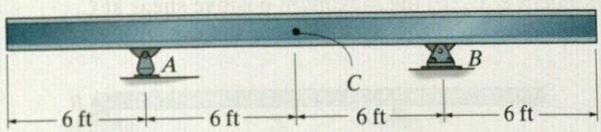


Probs. 6–1/2

6

6–3. Draw the influence lines for (a) the vertical reaction at A, (b) the moment at C, and (c) the shear just to the left of the support at B. Solve this problem using the basic method of Sec. 6.1.

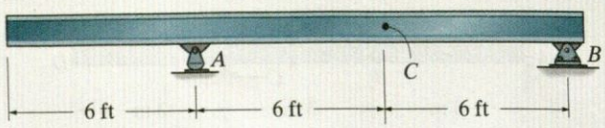
***6–4.** Solve Prob. 6–3 using the Müller-Breslau principle.



Probs. 6–3/4

6–5. Draw the influence lines for (a) the vertical reaction at B, (b) the shear just to the right of the rocker at A, and (c) the moment at C. Solve this problem using the basic method of Sec. 6.1.

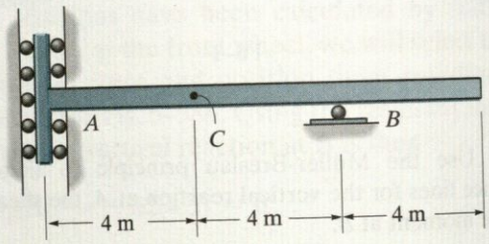
6–6. Solve Prob. 6–5 using Müller-Breslau's principle.



Probs. 6–5/6

6–7. Draw the influence line for (a) the moment at B, (b) the shear at C, and (c) the vertical reaction at B. Solve this problem using the basic method of Sec. 6.1. *Hint*: The support at A resists only a horizontal force and a bending moment.

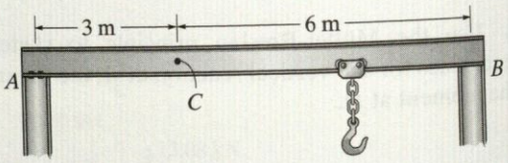
***6–8.** Solve Prob. 6–7 using the Müller-Breslau principle.



Probs. 6–7/8

6–9. Draw the influence line for (a) the vertical reaction at A, (b) the shear at C, and (c) the moment at C. Solve this problem using the basic method of Sec. 6.1. Assume A is a roller and B is a pin.

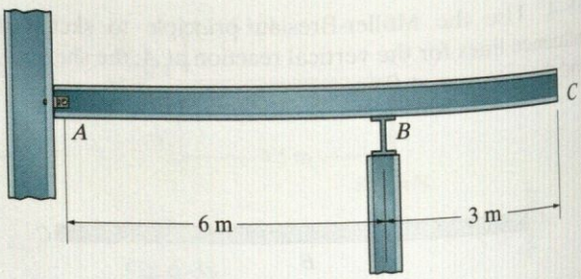
6–10. Solve Prob. 6–9 using Müller-Breslau's principle.



Probs. 6–9/10

6–11. Draw the influence lines for (a) the vertical reaction at B, (b) the shear just to the left of B, and (c) the moment at B. Solve this problem using the basic method of Sec. 6.1. Assume A is a pin and B is a roller.

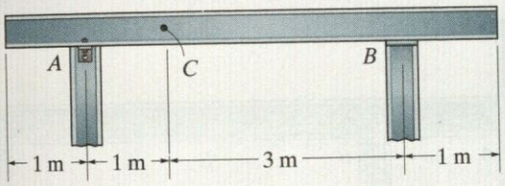
***6–12.** Solve Prob. 6–11 using Müller-Breslau's principle.



Probs. 6–11/12

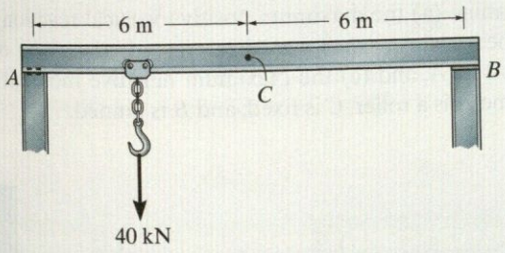
6–13. Draw the influence line for (a) the moment at C, (b) the shear just to the right of the support at B, and (c) the vertical reaction at B. Solve this problem using the basic method of Sec. 6.1. Assume A is a pin and B is a roller.

6–14. Solve Prob. 6–13 using the Müller-Breslau principle.



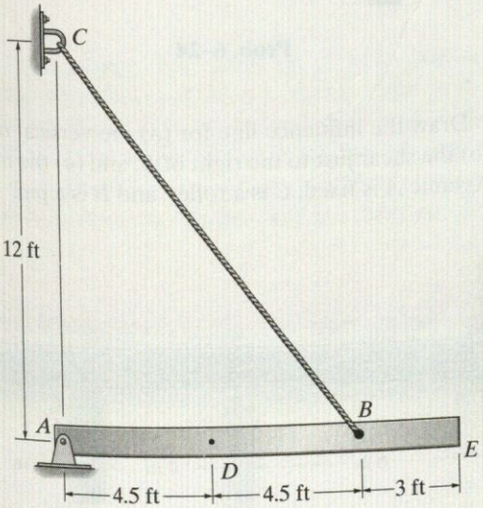
Probs. 6–13/14

6–15. The beam is subjected to a uniform dead load of 1.2 kN/m and a single live load of 40 kN. Determine (a) the maximum moment created by these loads at C, and (b) the maximum positive shear at C. Assume A is a pin, and B is a roller.



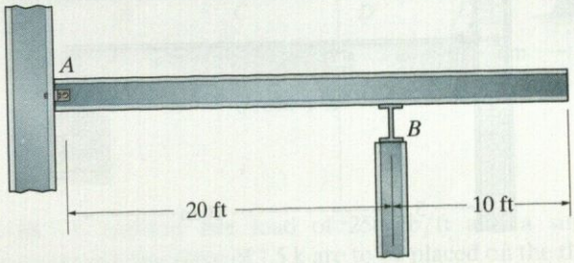
Prob. 6–15

*6–16. Draw the influence line for (a) the force in the cable BC, (b) the vertical reaction at A, and (c) the moment at D.



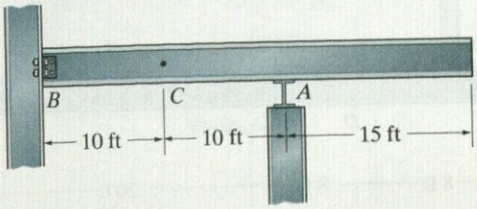
Prob. 6–16

6–17. A uniform live load of 300 lb/ft and a single live concentrated force of 1500 lb are to be placed on the beam. The beam has a weight of 150 lb/ft. Determine (a) the maximum vertical reaction at support B, and (b) the maximum negative moment at point B. Assume the support at A is a pin and B is a roller.



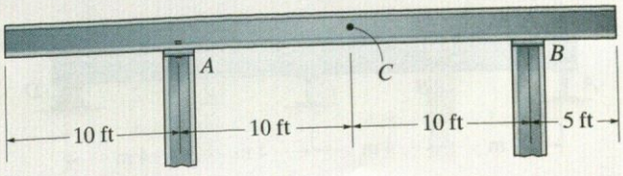
Prob. 6–17

6–18. The beam supports a uniform dead load of 0.4 k/ft, a live load of 1.5 k/ft, and a single live concentrated force of 8 k. Determine (a) the maximum positive moment at C, and (b) the maximum positive vertical reaction at B. Assume A is a roller and B is a pin.



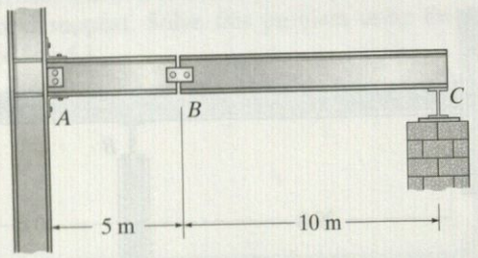
Prob. 6–18

6–19. The beam is used to support a dead load of 0.6 k/ft, a live load of 2 k/ft and a concentrated live load of 8 k. Determine (a) the maximum positive (upward) reaction at A, (b) the maximum positive moment at C, and (c) the maximum positive shear just to the right of the support at A. Assume the support at A is a pin and B is a roller.



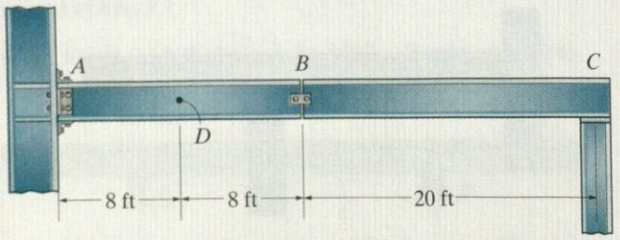
Prob. 6–19

*6–20. The compound beam is subjected to a uniform dead load of 1.5 kN/m and a single live load of 10 kN. Determine (a) the maximum negative moment created by these loads at A, and (b) the maximum positive shear at B. Assume A is a fixed support, B is a pin, and C is a roller.



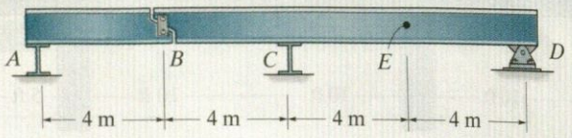
Prob. 6–20

6–21. Where should a single 500-lb live load be placed on the beam so it causes the largest moment at D? What is this moment? Assume the support at A is fixed, B is pinned, and C is a roller.



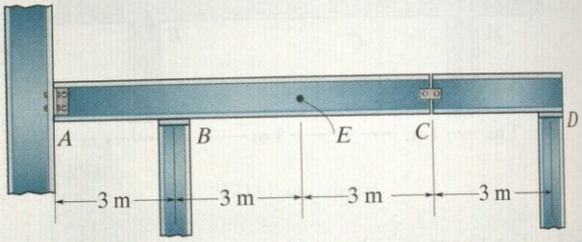
Prob. 6–21

6–22. The beam is subjected to a uniform live load of 1.2 kN/m, a dead load of 0.5 kN/m, and a single live load of 40 kN. Determine (a) the maximum positive moment created by these loads at E, and (b) the maximum positive shear at E. Assume A and C are roller, and B is a short link.



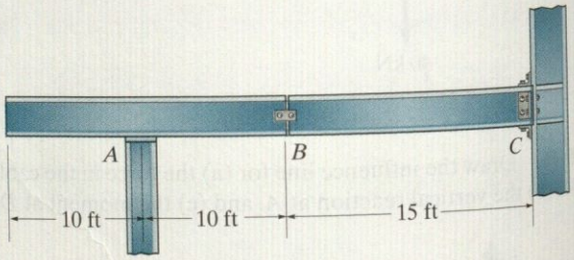
Prob. 6–22

6–23. The beam supports a uniform dead load of 500 N/m and a single live concentrated force of 3000 N. Determine (a) the maximum negative moment at E, and (b) the maximum positive shear at E. Assume the support at A is a pin, B and D are rollers, and C is a pin.



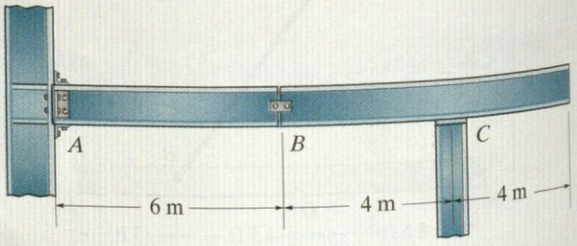
Prob. 6–23

*6–24. The beam is used to support a dead load of 400 lb/ft, a live load of 2 k/ft, and a concentrated live load of 8 k. Determine (a) the maximum positive vertical reaction at A, (b) the maximum positive shear just to the right of the support at A, and (c) the maximum negative moment at C. Assume A is a roller, C is fixed, and B is pinned.



Prob. 6–24

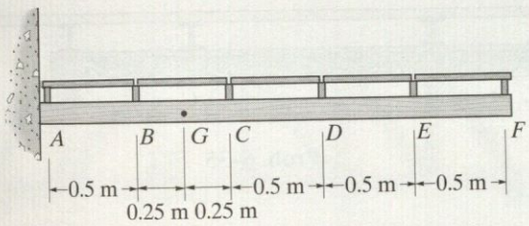
6–25. Draw the influence line for (a) the vertical reaction at A, (b) the shear just to the right of B, and (c) the moment at A. Assume A is fixed, C is a roller, and B is a pin.



Prob. 6–25

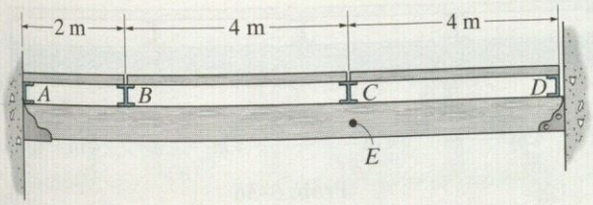
Sec. 6.4

6–26. A uniform live load of 1.8 kN/m and a single concentrated live force of 4 kN are placed on the floor beams. Determine (a) the maximum positive shear in panel *BC* of the girder and (b) the maximum moment in the girder at *G*.



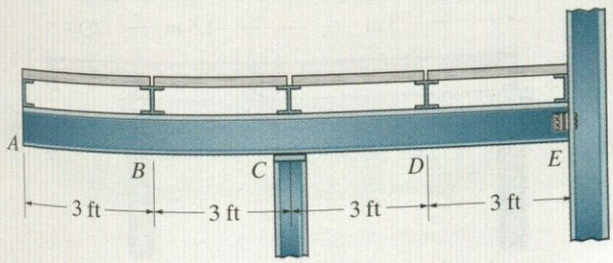
Prob. 6–26

6–27. Draw the influence line for the moment at *E* in the girder. Determine the maximum positive moment in the girder at *E* if a single concentrated live force of 5 kN and a uniform live load of 1.5 kN/m can be placed on the floor beams. Assume *A* is a pin and *D* is a roller.



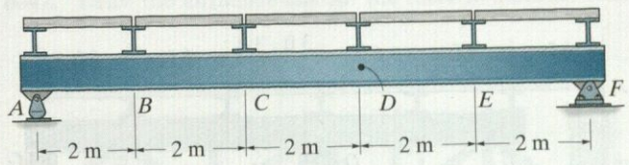
Prob. 6–27

***6–28.** A uniform live load of 2 k/ft and a single concentrated live force of 6 k are placed on the floor beams. If the beams also support a uniform dead load of 350 lb/ft, determine (a) the maximum positive shear in panel *CD* of the girder and (b) the maximum negative moment in the girder at *D*. Assume the support at *C* is a roller and *E* is a pin.



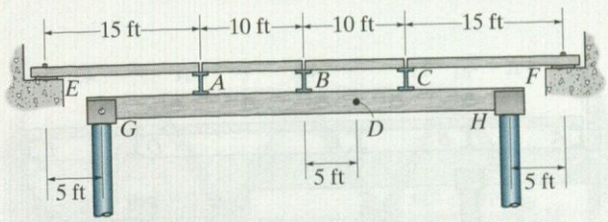
Prob. 6–28

6–29. Draw the influence line for (a) the shear in panel *BC* of the girder, and (b) the moment at *D*.



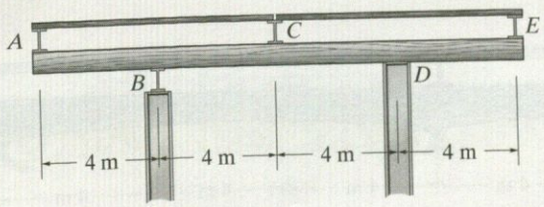
Prob. 6–29

6–30. A uniform live load of 250 lb/ft and a single concentrated live force of 1.5 k are to be placed on the floor beams. Determine (a) the maximum positive shear in panel *AB*, and (b) the maximum moment at *D*. Assume only vertical reaction occur at the supports.



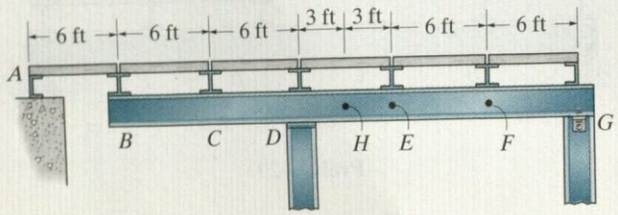
Prob. 6–30

6–31. A uniform live load of 16 kN/m and a single concentrated live force of 34 kN are placed on the top beams. If the beams also support a uniform dead load of 3 kN/m, determine (a) the maximum positive shear in panel *BC* of the girder and (b) the maximum positive moment in the girder at *C*. Assume *B* is a roller and *D* is a pin.



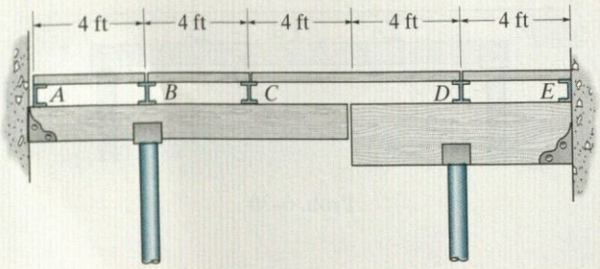
Prob. 6–31

*6–32. A uniform live load of 0.4 k/ft and a single concentrated live force of 6 k are placed on the floor beams. Determine (a) the maximum positive shear in panel *EF* of the girder, and (b) the maximum positive moment at *H*.



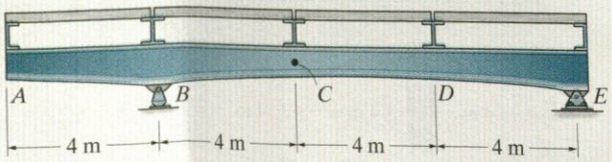
Prob. 6–32

6–33. A uniform live load of 300 lb/ft and a single concentrated live force of 2 k are to be placed on the floor beams. Determine (a) the maximum negative shear in panel *AB*, and (b) the maximum negative moment at *B*. Assume the supports at *A* and *E* are pins and the pipe columns only exert vertical reactions on the beams.



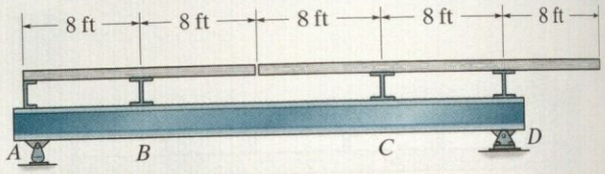
Prob. 6–33

6–34. A uniform live load of 8 kN/m and a single concentrated live force of 12 kN are placed on the floor beams. If the beams also support a uniform dead load of 400 N/m, determine (a) the maximum positive shear in panel *CD* of the girder and (b) the maximum positive moment in the girder at *C*.



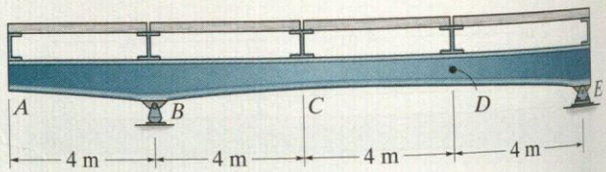
Prob. 6–34

6–35. Draw the influence line for the shear in panel *CD* of the girder. Determine the maximum negative live shear in panel *CD* due to a uniform live load of 500 lb/ft acting on the top beams.



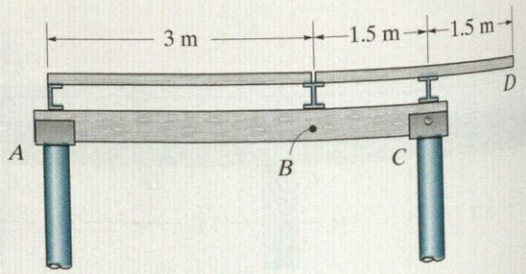
Prob. 6–35

*6–36. A uniform live load of 6.5 kN/m and a single concentrated live force of 15 kN are placed on the floor beams. If the beams also support a uniform dead load of 600 N/m, determine (a) the maximum positive shear in panel *CD* of the girder and (b) the maximum positive moment in the girder at *D*.



Prob. 6–36

6–37. A uniform live load of 1.75 kN/m and a single concentrated live force of 8 kN are placed on the floor beams. If the beams also support a uniform dead load of 250 N/m, determine (a) the maximum negative shear in panel *BC* of the girder and (b) the maximum positive moment at *B*.

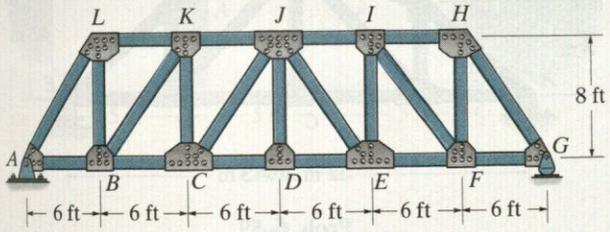


Prob. 6–37

Sec. 6.5

6–38. Draw the influence line for the force in (a) member *KJ* and (b) member *CJ*.

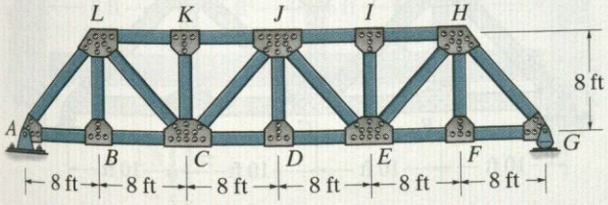
6–39. Draw the influence line for the force in (a) member *JI*, (b) member *IE*, and (c) member *EF*.



Probs. 6–38/39

**6–40.* Draw the influence line for the force in member *KJ*.

6–41. Draw the influence line for the force in member *JE*.

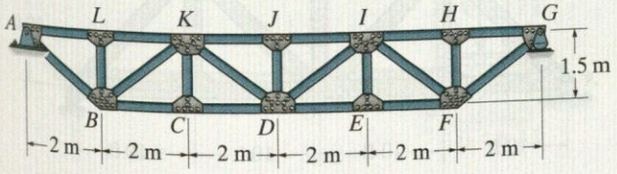


Probs. 6–40/41

6–42. Draw the influence line for the force in member *CD*.

6–43. Draw the influence line for the force in member *JK*.

**6–44.* Draw the influence line for the force in member *DK*.

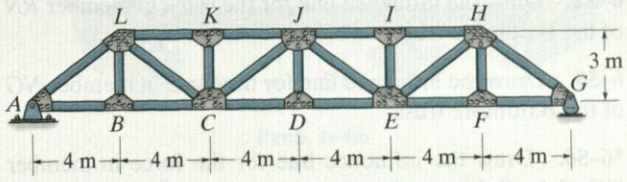


Probs. 6–42/43/44

6–45. Draw the influence line for the force in (a) member *EH* and (b) member *JE*.

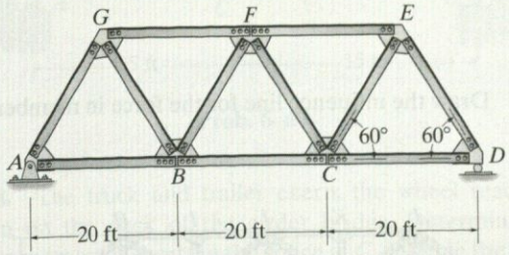
6–46. Draw the influence line for the force in member *JI*.

6–47. Draw the influence line for the force in member *AL*.



Probs. 6–45/46/47

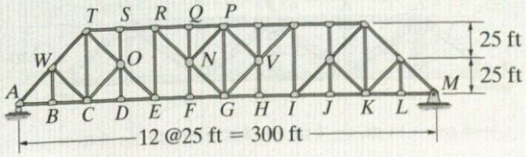
**6–48.* Draw the influence line for the force in member *BC* of the Warren truss. Indicate numerical values for the peaks. All members have the same length.



Prob. 6–48

6–49. Draw the influence line for the force in member *CD* of the Baltimore truss.

6–50. Draw the influence line for the force in member *PG* of the Baltimore truss.



Probs. 6–49/50

6–51. Draw the influence line for the force in member *RQ* of the Baltimore truss.

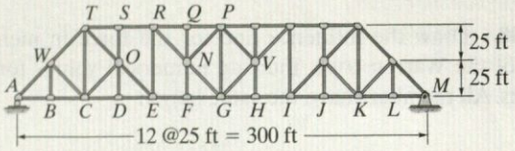
***6–52.** Draw the influence line for the force in member *TC* of the Baltimore truss.

6–53. Draw the influence line for the force in member *NP* of the Baltimore truss.

6–54. Draw the influence line for the force in member *RN* of the Baltimore truss.

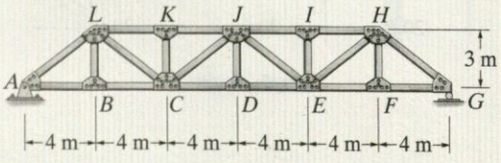
6–55. Draw the influence line for the force in member *NG* of the Baltimore truss.

***6–56.** Draw the influence line for the force in member *CO* of the Baltimore truss.



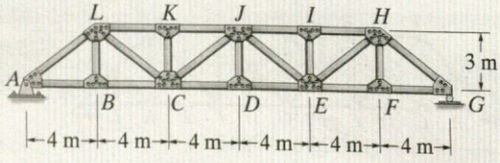
Probs. 6–51/52/53/54/55/56

6–57. Draw the influence line for the force in member *CD*.



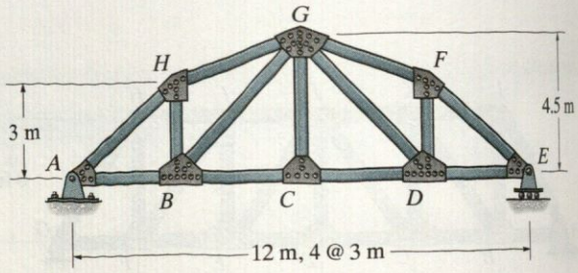
Prob. 6–57

6–58. Draw the influence line for the force in member *KJ*.



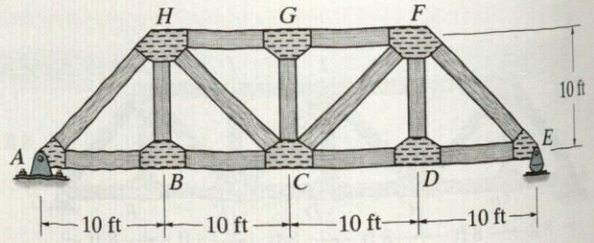
Prob. 6–58

6–59. Draw the influence line for the force in member *GD*, then determine the maximum force (tension or compression) that can be developed in this member due to a uniform live load of 3 kN/m that acts on the bridge deck along the bottom cord of the truss.



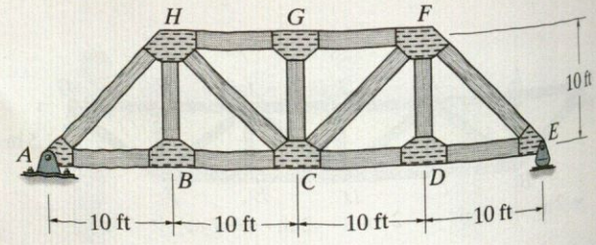
Prob. 6–59

***6–60.** Draw the influence line for the force in member *CD*, and then determine the maximum force (tension or compression) that can be developed in this member due to a uniform live load of 800 lb/ft which acts along the bottom cord of the truss.



Prob. 6–60

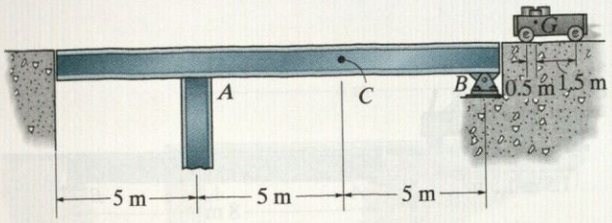
6–61. Draw the influence line for the force in member *CF*, and then determine the maximum force (tension or compression) that can be developed in this member due to a uniform live load of 800 lb/ft which is transmitted to the truss along the bottom cord.



Prob. 6–61

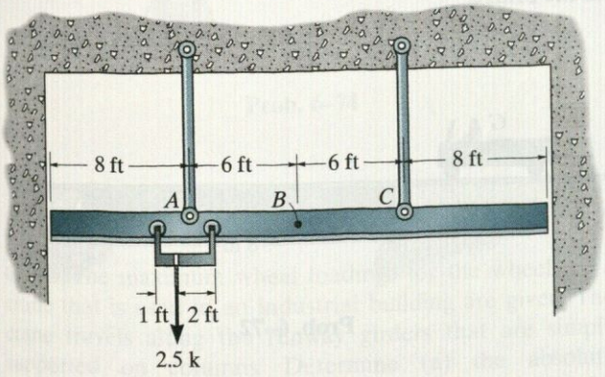
Sec. 6.6

6–62. Determine the maximum moment at point C on the single girder caused by the moving dolly that has a mass of 2 Mg and a mass center at G. Assume A is a roller.



Prob. 6–62

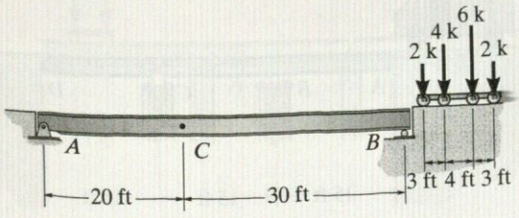
6–63. Determine the maximum moment in the suspended rail at point B if the rail supports the load of 2.5 k on the trolley.



Prob. 6–63

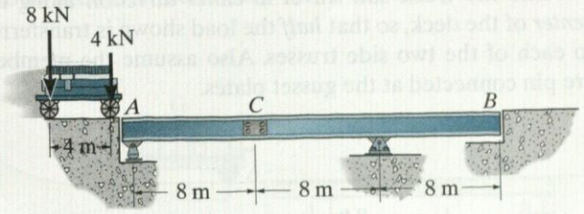
*6–64. Determine the maximum live moment at C caused by the moving loads.

6–65. Determine the maximum live shear at C caused by the moving loads.



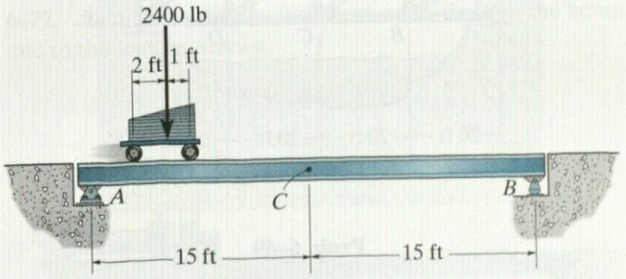
Probs. 6–64/65

6–66. Determine the maximum positive moment at the splice C on the side girder caused by the moving load which travels along the center of the bridge.



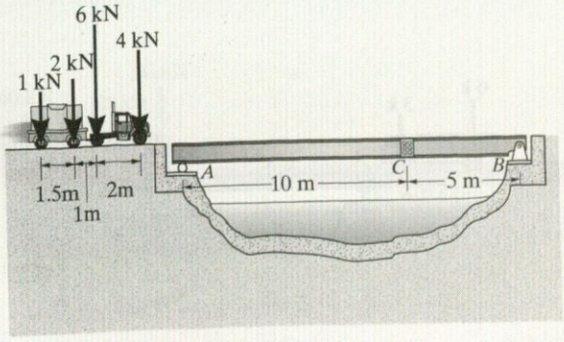
Prob. 6–66

6–67. Determine the maximum moment at C caused by the moving load.



Prob. 6–67

*6–68. The truck and trailer exerts the wheel reactions shown on the deck of the girder bridge. Determine the largest moment it exerts in the splice at C. Assume the truck travels in *either direction* along the *center* of the deck, and therefore transfers *half* of the load shown to each of the two side girders. Assume the splice is a fixed connection and, like the girder, can support both shear and moment.



Prob. 6–68

6–51. Draw the influence line for the force in member *RQ* of the Baltimore truss.

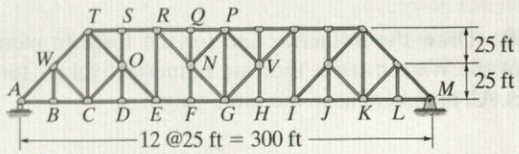
***6–52.** Draw the influence line for the force in member *TC* of the Baltimore truss.

6–53. Draw the influence line for the force in member *NP* of the Baltimore truss.

6–54. Draw the influence line for the force in member *RN* of the Baltimore truss.

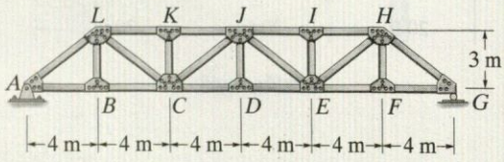
6–55. Draw the influence line for the force in member *NG* of the Baltimore truss.

***6–56.** Draw the influence line for the force in member *CO* of the Baltimore truss.



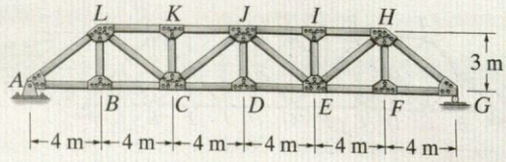
Probs. 6–51/52/53/54/55/56

6–57. Draw the influence line for the force in member *CD*.



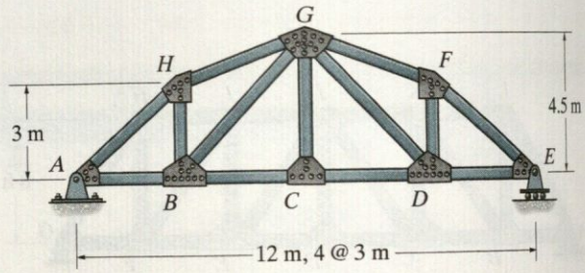
Prob. 6–57

6–58. Draw the influence line for the force in member *KJ*.



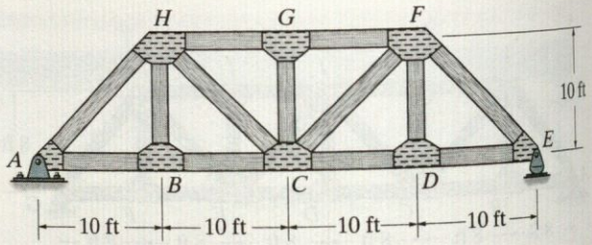
Prob. 6–58

6–59. Draw the influence line for the force in member *GD*, then determine the maximum force (tension or compression) that can be developed in this member due to a uniform live load of 3 kN/m that acts on the bridge deck along the bottom cord of the truss.



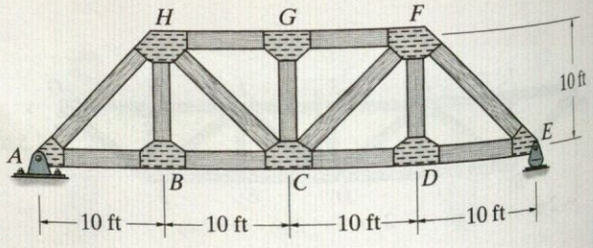
Prob. 6–59

***6–60.** Draw the influence line for the force in member *CD*, and then determine the maximum force (tension or compression) that can be developed in this member due to a uniform live load of 800 lb/ft which acts along the bottom cord of the truss.



Prob. 6–60

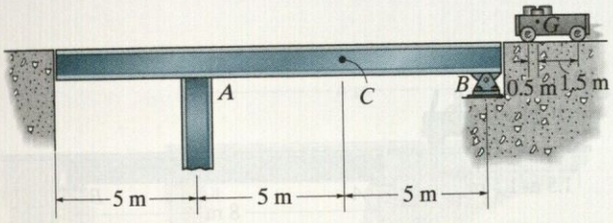
6–61. Draw the influence line for the force in member *CF*, and then determine the maximum force (tension or compression) that can be developed in this member due to a uniform live load of 800 lb/ft which is transmitted to the truss along the bottom cord.



Prob. 6–61

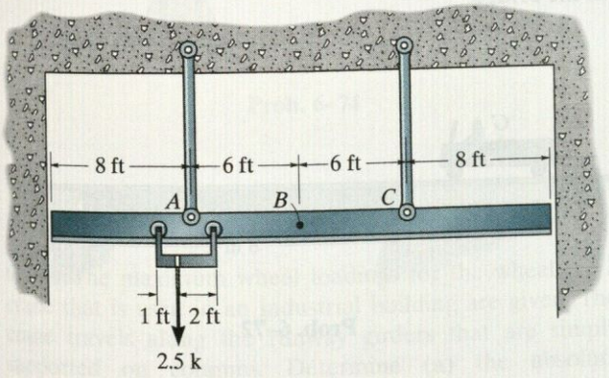
Sec. 6.6

6–62. Determine the maximum moment at point C on the single girder caused by the moving dolly that has a mass of 2 Mg and a mass center at G. Assume A is a roller.



Prob. 6–62

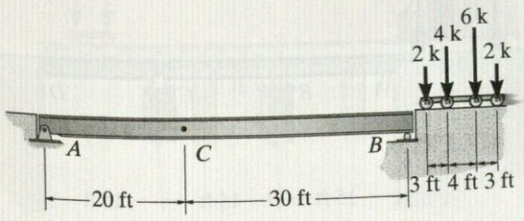
6–63. Determine the maximum moment in the suspended rail at point B if the rail supports the load of 2.5 k on the trolley.



Prob. 6–63

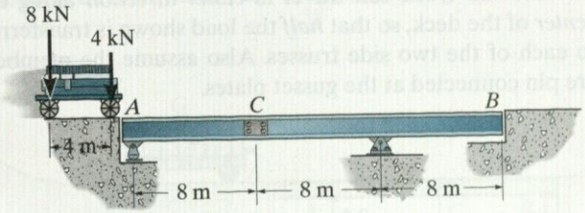
*6–64. Determine the maximum live moment at C caused by the moving loads.

6–65. Determine the maximum live shear at C caused by the moving loads.



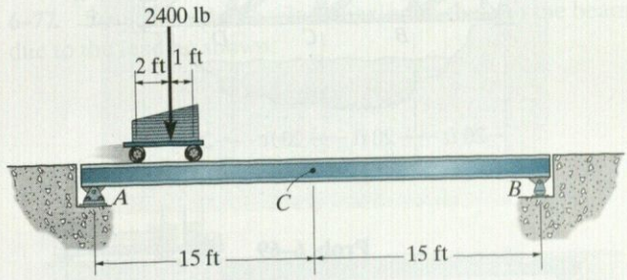
Probs. 6–64/65

6–66. Determine the maximum positive moment at the splice C on the side girder caused by the moving load which travels along the center of the bridge.



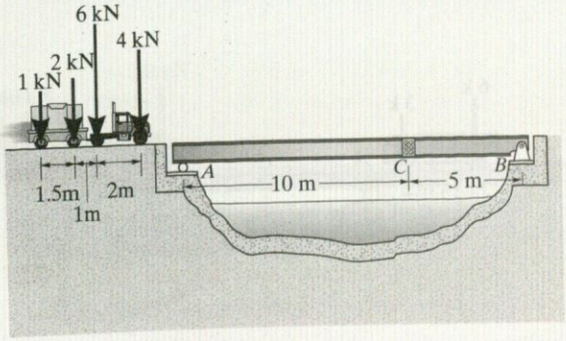
Prob. 6–66

6–67. Determine the maximum moment at C caused by the moving load.



Prob. 6–67

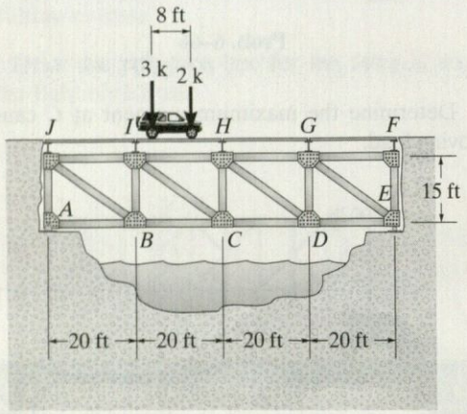
*6–68. The truck and trailer exerts the wheel reactions shown on the deck of the girder bridge. Determine the largest moment it exerts in the splice at C. Assume the truck travels in *either direction* along the *center* of the deck, and therefore transfers *half* of the load shown to each of the two side girders. Assume the splice is a fixed connection and, like the girder, can support both shear and moment.



Prob. 6–68

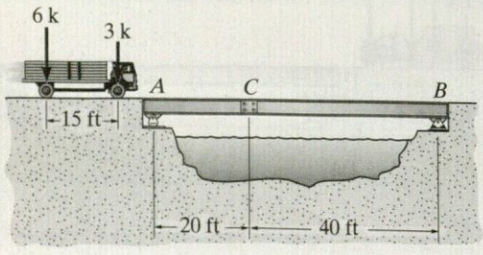
6

6–69. Draw the influence line for the force in member *GF* of the bridge truss. Determine the maximum live force (tension or compression) that can be developed in the member due to a 5-k truck having the wheel loads shown. Assume the truck can travel in *either direction* along the *center* of the deck, so that *half* the load shown is transferred to each of the two side trusses. Also assume the members are pin connected at the gusset plates.



Prob. 6–69

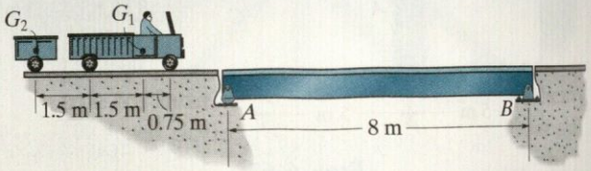
6–70. The 9-k truck exerts the wheel reactions shown on the deck of a girder bridge. Determine (a) the largest live shear it creates in the splice at *C*, and (b) the largest moment it exerts in the splice. Assume the truck travels in *either direction* along the *center* of the deck, and therefore transfers *half* of the load shown in each of the two side girders. Assume the splice is a fixed connection and, like the girder, can support both shear and moment.



Prob. 6–70

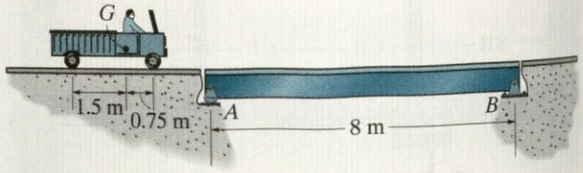
Sec. 6.7

6–71. The truck has a mass of 4 Mg and mass center at G_1, and the trailer has a mass of 1 Mg and mass center at G_2. Determine the absolute maximum live moment developed in the bridge.



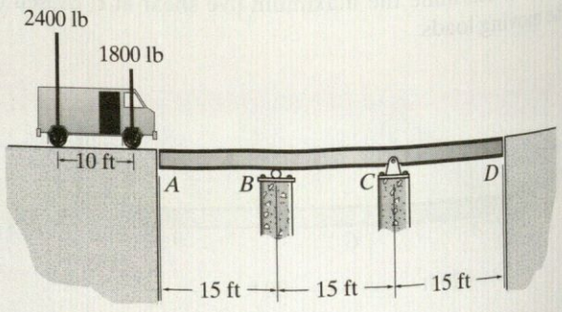
Prob. 6–71

***6–72.** The truck has a mass of 4-Mg and mass center at *G*. Determine the absolute maximum live moment developed in the bridge.



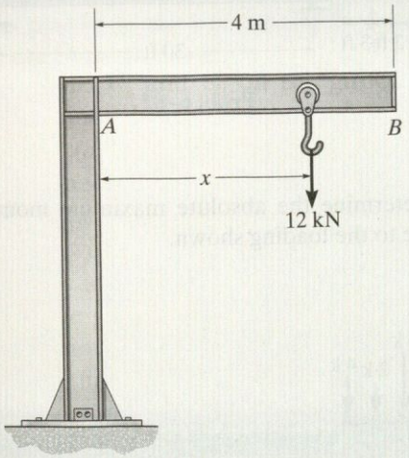
Prob. 6–72

6–73. Determine the absolute maximum live moment in the girder bridge due to the loading shown. The load is applied directly to the girder.



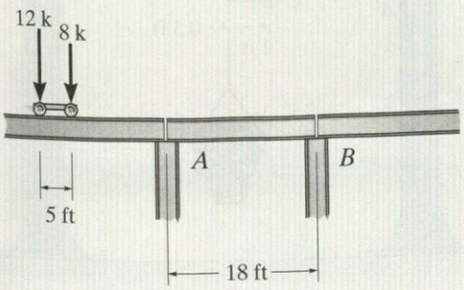
Prob. 6–73

6–74. Determine the absolute maximum live shear and absolute maximum live moment in the jib beam AB due to the crane loading. The end constraints require $0.1\text{ m} \le x \le 3.9\text{ m}$.



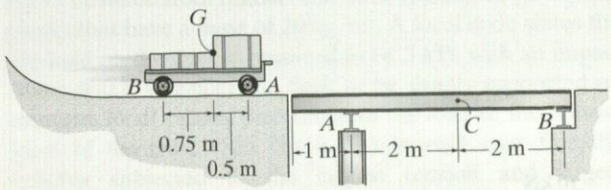
Prob. 6–74

6–75. The maximum wheel loadings for the wheels of a crane that is used in an industrial building are given. The crane travels along the runway girders that are simply supported on columns. Determine (a) the absolute maximum shear in an intermediate girder AB, and (b) the absolute maximum moment in the girder.



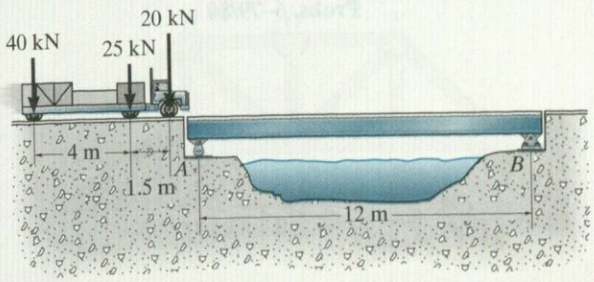
Prob. 6–75

***6–76.** The cart has a mass of 2 Mg and center of mass at G. Determine the maximum live moment created in the side girder at C as it crosses the bridge. Assume the cart travels along the *center* of the deck, so that *half* the load shown is transferred to each of the two side girders.



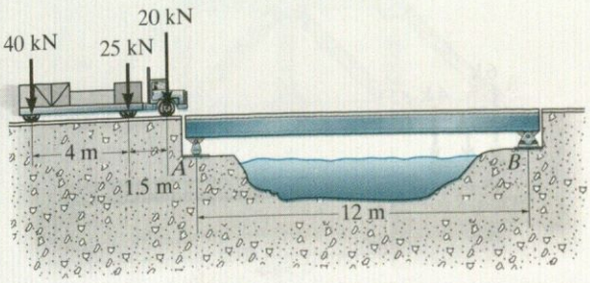
Prob. 6–76

6–77. Determine the absolute maximum shear in the beam due to the loading shown.



Prob. 6–77

6–78. Determine the absolute maximum moment in the beam due to the loading shown.



Prob. 6–78