CHAPTER 2

PROBLEM #2-1

1. $1.4\,D = 1.4(80) =$ ——— 112 PSF

2. $1.2D + 1.6L + 0.5(Lr \text{ or } S \text{ or } R)$

   $1.2(80) + 1.6(100) + 0.5(28) =$ ——— 270 PSF ←

3. $1.2D + 1.6(Lr \text{ or } S \text{ or } R) + (0.5L \text{ or } 0.5W)$

   $1.2(80) + 1.6(28) + 0.5(100) =$ ——— 190.8 PSF

4. $1.2D + 1.0W + 0.5L + 0.5(Lr \text{ or } S \text{ or } R)$

   $1.2(80) + 1.0(0) + 0.5(100) + 0.5(28) =$ ——— 160 PSF

5. $0.9D + 1.0W$

   $0.9(80) + 1.0(0)$ ——— 72 PSF (NO UPLIFT)

6. $1.2D + E + 0.5L + 0.2S$

   $1.2(80) + 1.0(0) + 0.5(100) + 0.2(28)$ ——— 151.6 PSF

7. $0.9D + 1.0E$

   $0.9(80) + 1.0(0) =$ ——— 72 PSF (NO UPLIFT)

GOVERNING FACTORED LOAD = 270 PSF (CASE 2.)

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-2

1. $1.4D = 1.4(15000) =$ ——— 21,000 lb

2. $1.2D + 1.6(L) + 0.5(L_r \text{ OR } S \text{ OR } R)$
$1.2(15000) + 1.6(\phi) + 0.5(\phi) =$ ——— 18,000 lb

3. $1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (0.5L \text{ or } 0.5W)$
$1.2(15,000) + 1.6(\phi) + 0.5(\phi)$ ——— 18,000 lb

4. $1.2D + 1.0W + 0.5L + 0.5(L_r \text{ OR } S \text{ or } R)$
$1.2(15,000) + 1.0(\phi) + 0.5(\phi) + 0.5(\phi)$ ——— 18,000 lb

5. $0.9(D) + 1.0W$ (UPLIFT)
$0.9(15,000) + 1.0(\phi)$ ——— 13,500 lb

6. $1.2D + 1.0E + 0.5L + 0.2S$
$1.2(15000) + 1.0(40,000) + 0.5(\phi) + 0.2(\phi)$ — 58,000 lb

7. $0.9(D) + 1.0E$ (UPLIFT)
$0.9(15,000) + 1.0(-40,000) =$ ——— -26,500 lb

MAXIMUM FACTORED LOADS:	
+ 58,000 lb	CASE 6.
- 26,500 lb	CASE 7.

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM #2-3

1. $1.4D = 1.4(100)$ ——— 140 K

2. $1.2D + 1.6L + 0.5(L_r \text{ or } S \text{ or } R)$

   $1.2(100) + 1.6(140) + 0.5(40)$ ——— 364 K

3. $1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (0.5L \text{ or } 0.5W)$

   $1.2(100) + 1.6(40) + 0.5(160)$ ——— 264 K

4. $1.2D + 1.0W + 0.5L + 0.5(L_r \text{ or } S \text{ or } R)$

   $1.2(100) + 1.0(160) + 0.5(140) + 0.5(40)$ ——— 350 K

5. $0.9D + 1.0W$ (UPLIFT)

   $0.9(100) + 1.0(-100)$ ——— -10 K

6. $1.2D + 1.0E + 0.5L + 0.2S$

   $1.2(100) + 1.0(180) + 0.5(140)$ ——— 370 K ←

7. $0.9D + 1.0E$ (UPLIFT)

   $0.9(100) + 1.0(-125)$ ——— -35 K ←

MAXIMUM FACTORED LOADS:

+370 K DOWNWARD (CASE 6.)

−35 K UPWARD (CASE 7.)

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-4

1. $1.4\,D = 1.4\,(24) =$ ——— 33.6 PSF

2. $1.2\,D + 1.6\,L + 0.5\,(Lr \text{ or } S \text{ or } R)$

$1.2(24) + 1.6(\emptyset) + 0.5(18) =$ ——— 37.8 PSF

3. $1.20 + 1.6\,(Lr \text{ or } S \text{ or } R) + (0.5\,L \text{ or } 0.5\,W)$

$1.2(24) + 1.6(18) + 0.5(45) =$ ——— 80.1 PSF

4. $1.2\,D + 1.0\,W + 0.5\,L + 0.5\,(Lr \text{ or } S \text{ or } R)$

$1.2(24) + 1.0(45) + 0.5(0) + 0.5(18) =$ ——— 82.8 PSF ←

5. $0.9\,D + 1.0\,W$ (UPLIFT)

$0.9(24) + 1.0(-45) =$ ——— -23.4 PSF ←

6. ——— DOES NOT CONTROL ——— (BY INSPECTION)

7. ——— DOES NOT CONTROL ——— (BY INSPECTION)

} NO EARTHQUAKE FORCE

MAXIMUM FACTORED LOADS:

+ 82.8 PSF CASE 4.

− 23.4 PSF CASE 5.

SFC✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-5

D = 75 PSF L = 80 PSF

BEAM SPACING = 6'-0"

D(PLF) = 75(6) = 450 PLF

L(PLF) = 80(6) = 480 PLF

1. 1.4 D = 1.4 (450) = _____ 630 PLF

2. 1.2 D + 1.6 L + 0.5 (Lr or S or R)

   1.2 (450) + 1.6 (480) = _____ 1308 PLF ←

3. 1.2 D + 1.6 (Lr or S or R) + (0.5L or 0.5W)

   1.2 (450) + 0.5 (480) = _____ 780 PLF

4. 1.2 D + 1.0 W + 0.5L + 0.5 (Lr or S or R)

   1.2 (450) + 0.5 (480) = _____ 780 PLF

5. 0.9 D + 1.0 W (NO UPLIFT)

   0.9 (450) = _____ 405 PLF

6. 1.2 D + 1.0 E + 0.5L + 0.2S

   1.2 (450) + 0.5 (480) = _____ 780 PLF

7. 0.9 D + 1.0 E (NO UPLIFT)

   0.9 (450) = _____ 405 PLF

MAXIMUM FACTORED LOAD = 1308 PLF CASE 2.

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-6

D = 20 PSF S = 30 PSF, Lr = 20 PSF, W = 40 PSF ↑ (-)
20 PSF ↓ (+)

BEAM SPACING = 5'-0"

D (PLF) = 20(5) = 100 PLF
S (PLF) = 30(5) = 150 PLF
Lr (PLF) = 20(5) = 100 PLF
W (PLF) = -40(5) = -200 PLF
OR = +20(5) = 100 PLF

1. 1.4D = 1.4(100) = ——— 140 PLF
2. 1.2D + 1.6L + 0.5(Lr or S or R)
   1.2(100) + 0.5(150) = ——— 195 PLF
3. 1.2D + 1.6(Lr or S or R) + (0.5L or 0.5W)
   1.2(100) + 1.6(150) + 0.5(100) = ——— 410 PLF ←
4. 1.2D + 1.0W + 0.5L + 0.5(Lr or S or R)
   1.2(100) + 1.0(100) + 0.5(0) + 0.5(150) = ——— 295 PLF
5. 0.9D + 1.0W (UPLIFT)
   0.9(100) + 1.0(-200) = ——— -110 PLF ←
6. 1.2D + 1.0E + 0.5L + 0.2S
   1.2(100) + 1.0(ϕ) + 0.5(ϕ) + 0.2(150) = ——— 150 PLF
7. ——— DOES NOT CONTROL - BY INSPECTION

MAXIMUM FACTORED LOADS:

410 PLF CASE 3. DOWNWARD
-110 PLF CASE 5. UPWARD

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-7

1. $D = 80 =$ ——————————— 80 PSF

2. $D+L = 80+100 =$ ——————————— 180 PSF ←

3. $D + (L_r \text{ or } S \text{ or } R) = 80+28 =$ ——————— 108 PSF

4. $D + 0.75(L) + 0.75(L_r \text{ or } S \text{ or } R)$

$80 + 0.75(100) + 0.75(28) =$ ——————— 176 PSF

5. $D + (0.6W) = 80+0 =$ ——————————— 80 PSF

6. $D + 0.75L + 0.75(0.6W) + 0.75(L_r \text{ or } S \text{ or } R)$

$80 + 0.75(100) + 0 + 0.75(28)$ ——————— 176 PSF

7. $0.6D + 0.6W$ (NO UPLIFT)

$0.6(80) + 0.6(\phi)$ ——————————— 48 PSF

8. $1.0D + 0.7E$

$1.0(80) + 0 =$ ——————————— 80 PSF

9. $1.0D + 0.525E + 0.75L + 0.75S$

$1.0(80) + 0.525(0) + 0.75(100) + 0.75(28) =$ —— 176 PSF

10. $0.6D + 0.7E$ (NO UPLIFT)

$0.6(80) + 0.7(\phi) =$ ——————————— 48 PSF

GOVERNING LOAD = 180 PSF CASE 2.

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-8

1. $D = 15000 =$ _____ 15,000 lb

2. $D + L = 15{,}000 + \phi =$ _____ 15,000 lb

3. $D + (L_r \text{ or } S \text{ or } R) = 15{,}000 + \phi =$ _____ 15,000 lb

4. $D + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$

$15{,}000 + 0.75(\phi) + 0.75(\phi) =$ _____ 15,000 lb

5. $D + (0.6W)$

$15{,}000 + 0.6(\phi) =$ _____ 15,000 lb

6. $D + 0.75L + 0.75(0.6W) + 0.75(L_r \text{ or } S \text{ or } R)$

$15{,}000 + 0.75(\phi) + 0.75(\phi) + 0.75(\phi) =$ _____ 15,000 lb

7. $0.6D + 0.6W$ (UPLIFT)

$0.6(15{,}000) + 0.6(\phi) =$ _____ 9,000 lb (NO UPLIFT)

8. $1.0D + 0.7E$

$1.0(15{,}000) + 0.7(40{,}000) =$ _____ 43,000 lb ←

9. $1.0D + 0.525E + 0.75L + 0.75S$

$1.0(15{,}000) + 0.525(40{,}000) + 0.75(\phi) + 0.75(\phi) = 36{,}000$ lb

10. $0.6D + 0.7E$

$0.6(15{,}000) + 0.7(-40{,}000) =$ _____ −19,000 lb ← (UPLIFT)

GOVERNING LOADS:

+43,000 lb CASE 8.

−19,000 lb CASE 10.

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-9

1. $D = 100 =$ _____ 100^K

2. $D + L = 100 + 140 =$ _____ 240^K

3. $D + (L_r \text{ or } S \text{ or } R) = 100 + 40 =$ _____ 140^K

4. $D + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$
$100 + 0.75(140) + 0.75(40) =$ _____ 235^K

5. $D + (0.6W) = 100 + 0.6(160) =$ _____ 196^K

6. $D + 0.75L + 0.75(0.6W) + 0.75(L_r \text{ or } S \text{ or } R)$
$100 + 0.75(140) + 0.75(0.6)(160) + 0.75(40) = 307^K$ ←

7. $0.6D + 0.6W$
$0.6(100) + 0.6(-100) =$ _____ ϕ^K

8. $1.0D + 0.7E$
$1.0(100) + 0.7(180) =$ _____ 226^K

9. $1.0D + 0.525E + 0.75L + 0.75S$
$1.0(100) + 0.525(180) + 0.75(140) + 0.75(\phi) = 299.5^K$

10. $0.6D + 0.7E$ (UPLIFT)
$0.6(100) + 0.7(-125) =$ _____ -27.5^K ←

GOVERNING LOADS:

307^K DOWNWARD (CASE 6.)
-27.5^K UPWARD (CASE 10.)

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM #2-10

1. $D = 24 =$ ——— 24 PSF

2. $D + L = 24 =$ ——— 24 PSF

3. $D + (L_r \text{ or } S \text{ or } R) = 24 + 18 =$ ——— 42 PSF

4. $D + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$

$24 + 0.75(\phi) + 0.75(18)$ ——— 37.5 PSF

5. $D + (0.6W)$

$24 + 0.6(45) =$ ——— 51 PSF

6. $D + 0.75L + 0.75(0.6W) + 0.75(L_r \text{ or } S \text{ or } R)$

$24 + 0 + 0.75(0.6)(45) + 0.75(18) =$ ——— 57.75 PSF ←

7. $0.6D + 0.6W$

$0.6(24) + 0.6(-45) =$ ——— -12.6 PSF ← UPLIFT

8. $1.0D + 0.7E$

$1.0(24) + 0.7(\phi) =$ ——— 24 PSF

9. $1.0D + 0.525E + 0.75L + 0.75S$

$1.0(24) + 0.525(\phi) + 0.75(\phi) + 0.75(\phi)$ ——— 24 PSF

10. $0.6D + 0.7E$ UPLIFT

$0.6(24) + 0.7(\phi) =$ ———

14.4 PSF (NO UPLIFT)

GOVERNING LOADS:

57.75 PSF CASE 6.

−12.6 PSF CASE 7. (UPLIFT)

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-11

D = 75 PSF L = 80 PSF

BEAM SPACING = 6'0"

D (PLF) = 75(6.0) = 450 PLF

L (PLF) = 80(6.0) = 480 PLF

1. D = 450 = _____ 450 PLF

2. D + L = 450 + 480 = _____ 930 PLF ←

3. D + (Lr or S or R) = 450 + ϕ _____ 450 PLF

4. D + 0.75L + 0.75 (Lr or S or R)

   450 + 0.75(480) + 0.75(ϕ) = _____ 810 PLF

5. D + (0.6W) = 450 + ϕ _____ 450 PLF

6. D + 0.75L + 0.75 (0.6W) + 0.75 (Lr or S or R)

   450 + 0.75(480) + 0.75(ϕ) + 0.75(ϕ) = _____ 810 PLF

7. 0.6 D + 0.6 W UPLIFT

   0.6(450) + 0 = _____ 270 PLF

8. 1.0D + 0.7E

   1.0(450) + 0.7(ϕ) = _____ 450 PLF

9. 1.0 D + 0.525 E + 0.75L + 0.75S

   1.0(450) + 0.525(ϕ) + 0.75(480) + 0.75(ϕ) = 810 PLF

10. 0.6D + 0.7E

    0.6(450) + 0.7(ϕ) = _____ 270 PLF

GOVERNING LOAD:

930 PLF CASE 2.

SFC ✓

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

PROBLEM # 2-12

$D = 20$ PSF $S = 30$ PSF, $L_r = 20$ PSF, $W = 40$ PSF ↑ (-)
BEAM SPACING = 5'-0" 20 PSF ↓ (+)

D (PLF) = 20 (5) = 100 PLF
S (PLF) = 30 (5) = 150 PLF
L_r (PLF) = 20 (5) = 100 PLF
W (PLF) = −40 (5) = −200 PLF
+20 (5) = 100 PLF

1. $D = 100 =$ ——— 100 PLF
2. $D + L = 100 =$ ——— 100 PLF
3. $D + (L_r \text{ or } S \text{ or } R) = 100 + 150 =$ ——— 250 PLF
4. $D + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$
   $100 + 0.75(150) =$ ——— 212.5 PLF
5. $D + (0.6W)$
   $100 + 0.6(100) =$ ——— 160 PLF
6. $D + 0.75L + 0.75(0.6W) + 0.75(L_r \text{ or } S \text{ or } R)$
   $100 + 0 + 0.75(0.6)(100) + 0.75(150) =$ — 257.5 PLF ←
7. $0.6D + 0.6W$ UPLIFT
   $0.6(100) + 0.6(-200) =$ ——— −60 PLF ← UPLIFT
8. ——— DOES NOT CONTROL (BY INSPECTION) ———
9. $1.0D + 0.525E + 0.75L + 0.75S$
   $1.0(100) + 0.525(\phi) + 0.75(\phi) + 0.75(150) =$ 212.5 PLF

GOVERNING LOADS	257.5 PLF	CASE 6.	
	−60 PLF	CASE 7.	UPLIFT

SFC ✓ 10. ——— DOES NOT CONTROL (BY INSPECTION) ———

© 2018 Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.