1–1. The floor of a light storage warehouse is made of 6-in.-thick cinder concrete. If the floor is a slab having a length of 10 ft and width of 8 ft, determine the resultant force caused by the dead load and that caused by the live load.

From Table 1–3.

\[ DL = (6\text{ in.})(9\text{ lb/ft}^2 \times \text{in.})(8\text{ ft})(10\text{ ft}) = 4.32 \text{ k} \]

Ans

From Table 1–4.

\[ LL = (125 \text{ lb/ft}^2)(8\text{ ft})(10\text{ ft}) = 10.0 \text{ k} \]

Ans

1–2. A building wall consists of 12-in. light-aggregate concrete block and 2-in. solid plaster on both sides. If the wall is 8 ft high, determine the load in pounds per foot length of wall that it exerts on the floor.

From Table 1–3,

Clay Brick = 115 psf

Wood Studs = 2(4) psf = 8 psf

Total = 123 psf

Therefore for an 8-ft high wall

Load = 8ft(123 psf) = 984 lb/ft

Ans

1–3. The hollow core panel is made from plain stone concrete. Determine the dead weight of the panel. The holes each have a diameter of 4 in.

\[ W = (144 \text{ lb/ft}^3)(12 \text{ in.})(6 \text{ in.})(\frac{7}{12} \text{ ft}) - 5(12 \text{ in.})(\pi)(\frac{2}{12} \text{ ft}^2) = 5.29 \text{ k} \]

Ans
1-4. The second floor of a light manufacturing building is constructed from a 4-in.-thick reinforced-concrete slab with an added 3-in. cinder concrete fill as shown. If the suspended ceiling of the first floor consists of metal lath and gypsum plaster, determine the dead load for design in pounds per square foot of floor area.

From Table 1-3:
- 4 in. - normal-weight concrete = 412 lbs/ft³
- 3 in. - cinder concrete = 27 lbs/ft³

Total = 412 + 27 = 439 lbs/ft³

1-5. The floor of a classroom is made of 125-mm thick lightweight plain concrete, If the floor is a slab having a length of 8 m and width of 6 m, determine the resultant force caused by the dead load and the live load.

\[ F_p = \frac{0.153 \text{kN/m}^2 \times \text{area}}{125 \text{ mm/mm}^3} \]

\[ F_p = \frac{0.153 \times 8 \times 6}{125} = 0.90 \text{kN} \]

\[ F_L = (1.92 \text{kN/m}^2 \times 8 \times 6) = 92.16 \text{kN} \]

\[ F = F_p + F_L = 90.96 + 92.16 = 183.12 \text{kN} \]

1-6. The present floor beam is made from concrete having a specific weight of 150 lb/ft³. It is to be used for a floor in an office of an office building, calculate its dead and live loadings per foot length of beam.

Dead Load:
- DC = 150 lb/ft³ \times (4.08 ft) \times 3.172 ft = 233 lb/ft

Live Load:
- LL = 150 lb/ft³ \times (4.08 ft) = 315 lb/ft

1-7. The T-beam used in a heavy storage warehouse is made of concrete having a specific weight of 125 lb/ft³. Determine the dead load per foot length of beam, and the live load on the top of the beam per foot length of beam. Neglect the weight of the steel reinforcement.

\[ F_D = (6.20 \times 12.0) = 74.40 \text{ lb/ft} \]

\[ F_L = (1.06 \times 12.0 \times 25 \times 12.0) = 451.6 \text{ lb/ft} \]

1-8. The second floor of a light manufacturing building is constructed from a 5-in.-thick reinforced-concrete slab with an added 4-in. cinder concrete fill as shown. If the suspended ceiling of the first floor consists of metal lath and gypsum plaster, determine the dead load for design in pounds per square foot of floor area.

From Table 1-2:
- 5-in. concrete slab = 4 in. cinder fill = 50 psf

Total dead load = 106.25 psf

1-9. The beam supports the roof made from asphalt shingles and wood sheathing boards. If the boards have a thickness of \( \frac{1}{4} \) in. and a specific weight of 50 lb/ft³, and the roof's angle of slope is 30°, determine the dead load of the roofing—per square foot—that is supported in the x and y directions by the purlins.

Weight per square foot = (30 lb/ft²) \times \frac{1}{4} \text{ in.} = 12.5 lb/ft²

From Table 1-3:
- Total = 2 lb/ft²

\[ p_x = \frac{12.5 \times \sin 30°}{12 \text{ in.}} = 4.12 \text{ psf} \]

\[ p_y = \frac{12.5 \times \cos 30°}{12 \text{ in.}} = 7.14 \text{ psf} \]
1-4. The second floor of a light manufacturing building is constructed from a 4-in.-thick reinforced-concrete slab with an added 3-in. cinder concrete fill, as shown. If the suspended ceiling of the first floor consists of metal lath and gypsum plaster, determine the dead load for design in pounds per square foot of floor area.

From Table 1-3:
4 in. - reinforced concrete slab = 412 lb/ft²
3 in. - cinder concrete = 30 lb/ft²
Plaster and lath = 60 lb/ft²
Total
p = 55 lb/ft²
Ans

1-5. The floor of a classroom is made of 125-mm thick lightweight plain concrete. If the floor is a slab having a length of 8 m and width of 6 m, determine the resultant force caused by the dead load and the live load.

\[ F_d = 0.015 \times 90 \text{ kN/m}^2 = 1.35 \text{ kN/m}^2 \]  
\[ E = 1.92 \text{ kN/mm}^2 = 1.92 \text{ kN/m}^2 \]  
\[ R_{max} = 92.16 \text{ kN} = 92.2 \text{ kN} \]  
\[ F = F_d + E = 90 \text{ kN} + 92.2 \text{ kN} = 182.2 \text{ kN} \]  
Ans

1-6. The present floor beam is made from concrete having a specific weight of 150 lb/ft³. If it is to be used for a floor in an office of an office building, calculate its dead and live loadings per foot length of beam.

Dead load:
\[ DL = 150 \text{ lb/ft} \times \left( 4 120 \text{ in} \times \frac{1}{144} \frac{\text{ft}}{\text{in}} \right) = 630 \text{ lb/ft} \]  
Ans

Live load:
\[ LL = 150 \text{ lb/ft} \times 0.47 \text{ ft} = 70.5 \text{ lb/ft} \]  
Ans

1-7. The T-beam used in a heavy storage warehouse is made of concrete having a specific weight of 125 lb/ft³. Determine the dead load per foot length of beam, and the live load on the top of the beam per foot length of beam. Neglect the weight of the steel reinforcement.

\[ 4 = 30 105 + 3200 + 12 \times 10 = 450 \text{ lb/ft} \]  
\[ DL = 125 \text{ lb/ft} \times \frac{1}{144} \text{ ft/ft} = 125 \text{ lb/ft} \]  
Ans

1-8. The second floor of a light manufacturing building is constructed from a 5-in.-thick reinforced-concrete slab with an added 4-in. cinder concrete fill, as shown. If the suspended ceiling of the first floor consists of metal lath and gypsum plaster, determine the dead load for design in pounds per square foot of floor area.

From Table 1-3:
5 in. - concrete slab = 122, 35 = 400
3 in. - cinder fill = 30 lb/ft² = 30
metal lath & plaster = 60
Total dead load = 30 lb/ft²
Ans

1-9. The beam supports the roof made from asphalt shingles and wood sheathing boards. If the boards have a thickness of 1 1/2 in. and a specific weight of 50 lb/ft³, and the roof's angle of slope is 30°, determine the dead load of the roofing — per square foot — that is supported in the x and y directions by the purlins.

Weight per square foot = 50 lb/ft³ \times \frac{1.5 \text{ in}}{12 \text{ in}} = 6.25 \text{ lb/ft²}

From Table 1-3:
Shingles = 2 lb/ft²
Total
p_x = 8.25 lb/ft²
p_y = 10.25 lb/ft²
Ans
1-13. Determine the resultant force acting on the face of the truss-supported sign if it is located near Los Angeles, California on open flat terrain. The sign has a width of 6 m and a height of 3 m as indicated. Use an importance factor of $I = 0.87$.

![Diagram of sign with trusses]

From the wind map $V = 38 \text{ m/s}$

$$K_v = 0.85$$

$$K_n = 1$$

$$K_s = 1$$

$$q_v = 0.613K_pK_vV^2I$$

$$q_v = 0.613(0.85)(0)(38)^2(0.87) = 654.58 \text{ N/m}^2$$

$$F = q_vGC_A_f$$

$$G = 0.85$$

$$M/N = 6/3 = 2 < 6, \quad C_f = 1.2$$

$$A_f = 3(6) = 18 \text{ m}^2$$

$$F = 654.58(0.85)(1.2)(18) = 12.0 \text{ kN} \quad \text{Ans.}$$

1-14. Determine the resultant force of the wind on the sign. Use an importance factor of $I = 0.87$. The sign is located on flat ground near Chicago, Illinois.

![Diagram of sign with wind arrows]

From the wind map $V = 90 \text{ mi/h}$

$$K_v = 0.85$$

$$K_n = 1$$

$$K_s = 1$$

$$q_v = 0.00256K_pK_vV^2I$$

$$q_v = 0.00256(0.85)(0)(90)^2(0.87) = 15.33 \text{ lb/ft}^2$$

$$F = q_vGC_A_f$$

$$G = 0.85$$

$$M/N = 8/6 = 1.33 < 6, \quad C_f = 1.2$$

$$A_f = 6(8) = 48 \text{ ft}^2$$

$$F = 15.33(0.85)(1.2)(48) = 751 \text{ lb} \quad \text{Ans.}$$