

Design Loads
Load Combinations
Example 1

Determine the total load acting on the roof of a building using ASD and LRFD load combinations.

Floor Dead Load = 15 psf
Roof Dead Load = 12 psf
Floor Live Load = 40 psf
Snow Load = 30 psf
Roof Live Load = 20 psf

LOAD COMBINATIONS ARE FOUND IN CHAPTER 2

* LOADS ACTING ON THE ROOF INCLUDE:

- ROOF DEAD LOAD
- SNOW LOAD
- ROOF LIVE LOAD

ASD: (FOUND ON PAGE 8)

1. D

$$= 12 \text{ psf}$$

2. D+L

$$= 12 \text{ psf} + 0 \text{ psf}$$

$$= 12 \text{ psf}$$

3. a) D+L_r

$$= 12 \text{ psf} + 20 \text{ psf}$$

$$= 32 \text{ psf}$$

b) D+S

$$= 12 \text{ psf} + 30 \text{ psf}$$

$$= 42 \text{ psf}$$

c) D+R

$$= 12 \text{ psf} + 0 \text{ psf}$$

$$= 12 \text{ psf}$$

4. $D + 0.75L + 0.75(L_r, S, R)$

a) $D + 0.75L_r$

$$= 12 \text{ psf} + 0.75(20 \text{ psf})$$

$$= 27 \text{ psf}$$

b) $D + 0.75S$

$$= 12 \text{ psf} + 0.75(30 \text{ psf})$$

$$= 34.5 \text{ psf}$$

$$\begin{aligned} \text{c) } D + 0.75R \\ &= 12 \text{ psf} + 0 \text{ psf} \\ &= 12 \text{ psf} \end{aligned}$$

$$\begin{aligned} \text{5. } D + 0.6W \\ &= 12 \text{ psf} \end{aligned}$$

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

$$\begin{aligned} \text{a) } D + 0.75L_r \\ \text{b) } D + 0.75S \\ \text{c) } D + 0.75R \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{a) } D + 0.75L_r \\ \text{b) } D + 0.75S \\ \text{c) } D + 0.75R \end{aligned}} \right\} \text{ SAME AS 4}$$

$$\begin{aligned} \text{7. } 0.6D + 0.6W \\ &= 0.6(12 \text{ psf}) \\ &= 7.2 \text{ psf} \end{aligned}$$

THE LARGEST TOTAL LOAD CONTROLS

THEREFORE,

TOTAL LOAD = 42 psf,
LOAD COMBO #3b CONTROLS

LRFD: (FOUND ON PAGE 7)

$$\begin{aligned} \text{1. } 1.4D \\ &= 1.4(12 \text{ psf}) \\ &= 16.8 \text{ psf} \end{aligned}$$

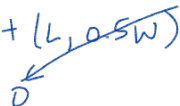
$$\text{2. } 1.2D + 1.6L + 0.5(L_r, S, R)$$

$$\begin{aligned} \text{a) } 1.2D + 0.5L_r \\ &= 1.2(12 \text{ psf}) + 0.5(20 \text{ psf}) \\ &= 24.4 \text{ psf} \end{aligned}$$

$$\begin{aligned} \text{b) } 1.2D + 0.5S \\ &= 1.2(12 \text{ psf}) + 0.5(30 \text{ psf}) \\ &= 29.4 \text{ psf} \end{aligned}$$

$$\begin{aligned} \text{c) } 1.2D + 0.5R \\ &= 1.2(12 \text{ psf}) \\ &= 14.4 \text{ psf} \end{aligned}$$

$$3. 1.2D + 1.6(L_r, S, R) + (L, 0.5W)$$



$$a) 1.2D + 1.6L_r$$

$$= 1.2(12 \text{ psf}) + 1.6(20 \text{ psf})$$


$$= 46.4 \text{ psf}$$

$$b) 1.2D + 1.6S$$

$$= 1.2(12 \text{ psf}) + 1.6(30 \text{ psf})$$

$$= 62.4 \text{ psf}$$

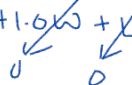
$$c) 1.2D + 1.6R$$



$$= 1.2(12 \text{ psf})$$

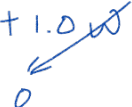
$$= 14.4 \text{ psf}$$

$$4. 1.2D + 1.0W + 0.5(L_r, S, R)$$



$$\left. \begin{array}{l} a) \\ b) \\ c) \end{array} \right\} \text{SAME AS \#2}$$

$$5. 0.9D + 1.0W$$



$$= 0.9(12 \text{ psf})$$

$$= 10.8 \text{ psf}$$

LARGEST TOTAL LOAD CONTROLS, THEREFORE

TOTAL LOAD = 62.4 psf &
LOAD COMBO #3b CONTROLS