Rectangular Combined Footing

In many cases, the column loads and the soil bearing capacity are such that the standard spread footing design will require the extension of foundation beyond the property line. In such a case, two or more columns can be supported on a single rectangular foundation, as shown in Figure. If the net allowable bearing capacity is known, the size of the foundation *(B* x *L)* can be determined in the following manner:

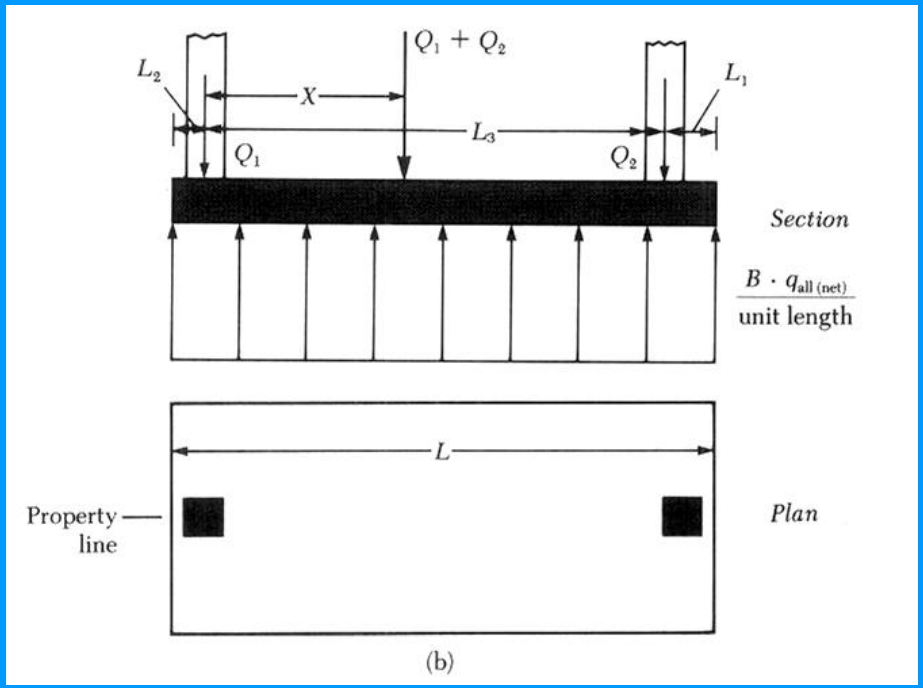
1. **Determine the area of the foundation, *A,* as**

$$A = \frac{Q_1 + Q_2}{q_{all(net)}}$$

Where *Q_1 and* Q_2 are the column loads and $q_{all(net)}$ is the net allowable bearing capacity

2. **Determine the location of the resultant of the column loads.**

$$X = \frac{Q_2 L_3}{Q_1 + Q_2}$$


$Q_1 + Q_2$
L_2
X
L_1
L_3
Q_1
Q_2
Section
$B \cdot q_{all\ (net)}$
unit length
L
Property line
Plan

(b)

3. For uniform distribution of soil pressure under the foundation, the resultant of the column loads should pass through the centroid of the foundation. Thus;

$$L = 2(L_2 + X)$$

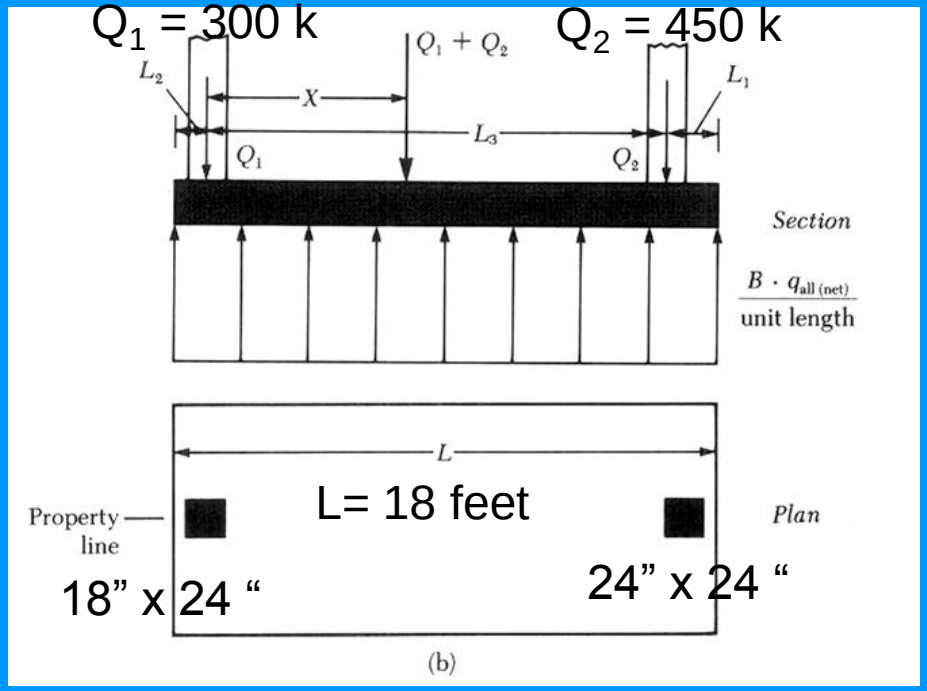
Where L = length of the foundation

4. Once the length L is determined, the value of L_1 can be obtained as

$$L_1 = L - L_2 - L_3$$

Note that the magnitude of L_2 will be known, depending on the extent of the property line.

Example # 1: For The column shown in previous figure, find out the size of rectangular combined footing, if allowable bearing pressure is 6000 lb/ft^2. The unit weight of overburdened is 350 lb/ft^2.



$$Q_{an} = q_a - W_f - W_b$$
$$= 6000 - 350 = 5650\ K$$

R = 300 + 450 = 750 K

As we know that

$$X = \frac{Q_2 L_3}{Q_1 + Q_2}$$

X = 450 * 18 / 750 = 10.8 feet

Also we know that

$$L = 2\,(L_2 + X)$$

$$= 2 * (10.8 + 0.75) = 23.25 \text{ feet}$$

Once the length *L* is determined, the value of L_l can be obtained as

$$L_l = L - L_2 - L_3$$

$$= 23.25 - (0.75 + 18) = 4.5 \text{ feet}$$

$$A_f = \text{Column load} / q_{an}$$

$$(B \times L) = 750 \times 1000 / 5650$$

$$B = 750 \times 1000 / 5650\ 23.25 = 5.71 \text{ feet}$$