

4.6-2 A 20-foot (6,000 mm) long column is pinned at the bottom and fixed against rotation but free to translate at the top. It must support a service dead load of 110 kips (490 k N) and a service live load of 110 kips (490 k N) .

a. Select a W12 of A992 steel ($F_y = 50$ Ksi) . Use the column load tables.

- 1. Use LRFD.
- 2. Use ASD.

b. Select a W18 (W460) of A529 Grade 55 steel ($F_y = 55$ ksi (380 MPa)) . Use the trial-and-error approach covered in Section 4.6.

PART a) $k = 2.0$ TABLE C-A-7.1 $\lambda = kL = 2.0(20\text{ft}) = 40\text{ft}$

LRFD $P_u = 1.2D + 1.6L = 1.2(110\text{k}) + 1.6(110\text{k}) = 308\text{k}$

$\phi_c P_n = 308\text{k}$

* FROM TABLE 4-1a (4-1a) (4-1a) \Rightarrow W12x120
 $\phi_c P_n = 338\text{k}$

ASD $P_a = D + L = 110\text{k} + 110\text{k} = 220\text{k}$

* FROM TABLE 4-1a \Rightarrow W12x120 $\frac{P_n}{\Omega_c} = 225\text{k}$