DOOR 101A, 101B, 101D, 102A, 102C & 103E
CALCULATE FORCES:

8" THICK CONCRETE TILT-UP WALL (8/12) x 150#/FT^3 = 100#/FT^2
Max Height Concrete tilt-up wall over door = 14.33ft 14.33 x 100#/FT^2 = 1433#/LF

BUILT-UP ROOF & BAR JOIST
1/2 DISTANCE TO CLOSEST COLUMN = 25FT 20#/FT^2 x 25FT = 500 #/LF

ROLL-UP DOOR WEIGHT FROM FACTORY = 4100#
4100#/21FT = 100 #/LF

TOTAL DEAD LOAD = 2033 #/LF or 2.0k/LF

LIVE ROOF LOAD = 20 #/FT^2 x 25FT = 500 #/LF or .5k/LF

MAXIMUM VERTICAL MWFRS ON ROOF IS (-)37.9 psf SEE MWFRS REPORT.
37.9 #/FT^2 X 25 FT = 947.5 #/LF or 0.9k/LF

IBC 2009 Eqn 16-4
1.2D + 1.6W + f1L + 0.5(Lr)
1.2(2.0k/LF) + 1.6(.9k/LF) + 0.5(0) + 0.5(.5k/LF) = 4.1k/LF

Delta Max □= 5wL^4/384EI (AISC Pg 3-220)
I min = 5wL^4 * 1728 / (384E □) □= L*12"/ft /200
= 5 (4.1k/LF) * (21.5ft)^4 *1728 / (384 * 29,000 * (21.5*12/200))
= 526.9 in^4

Mmax = (1/8) wL^2 = (1/8) * 4.1 *21.5^2 = 236.9 (ft-k)
Vmax = wL/2 = 4.1 * 21.5/2 = 44.1k
Z required = Mmax / (.9 Fy) = (236.9 x 12"/ft) / (.9 * 50ksi) = 63.2 in^3
I required = 526.9 in^4

Select W16X50 A=14.7 d=16.3 tw=0.380 Zxx=92.0>63.2 Ixx=659 > 526.9
Check Shear (d * tw * ksi) > Vmax (16.3 * .380 * 50) = 309 > 44.1

44.1k each column
20'-3" " "
K=1 ∴ KL = 20'-3"

KL = ~~1x 44.1 = 44.1~~

Select HSS 8x~~8~~x 3/4

HSS 6x6x ¼"

pg 1-90

Thickness = 0.233"
Area = 5.24

Wt/Ft = 18.99 #/Ft
I = 28.6
S = 9.54
r = 2.34
Z = 11.2

$$kL/r = \frac{1.25 \times 18 \times 12"/ft}{2.34} = 115.4$$

$$F_c = \frac{(\pi^2 \times E)}{(kL/r)^2} > .44(F_y) =$$

$$\frac{\pi^2 \times 29{,}000}{(115.4)^2} > .44(46\,ksi)$$

$$21.5 > 20.24$$

$$F_{cr} = 0.658^{F_y/F_e} \times F_y$$
$$= 0.658^{46/21.5} \times 46\,ksi$$
$$F_{cr} = 0.658^{2.1395} \times 46\,ksi = 18.79\,ksi$$

$\phi_c = 0.90$

$\phi_c \times P_n = \phi_c \times F_{cr} \times Area$
$= (.9)(18.79)(5.24)$
$= 88.61$

$88.61^k > 4.1^k$ Ok