CASED OPENING BETWEEN BUILDING 30FEET OPENNING WIDTH
CALCULATE FORCES:

WIDEFLANGE BEAM W16x50 IN WALL 50 plf — 100#/LF

METAL INSULATED WALL PANEL ABOVE LOWER ROOF 3.5FT TALL
20#/FT^2 x 3.5FT = 70 #/LF

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

TOTAL DEAD LOAD = 670 #/LF or 0.67k/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
w = 1.2D + 1.6W + f1L + 0.5(Lr)
w = 1.2(0.67k/LF) + 1.6(.9k/LF) + 0.5(0) + 0.5(.5k/LF) = 2.49k/LF

Delta Max □= 5wL^4/384EI (AISC Pg 3-220)
I min = 5wL^4 * 1728 / (384E □) □= L*12"/ft /200
= 5 (2.49k/LF) * (30ft)^4 *1728 / (384 * 29,000 * (30*12/200))
= 869.4 in^4

Mmax = (1/8) wL^2 = (1/8) * 2.49 *30^2 = 280.1 (ft-k)
Vmax = wL/2 = 2.49 * 30/2 = 37.35k
Z required = Mmax / (.9 Fy) = (869.4 x 12"/ft) / (.9 * 50ksi) = 231.84 in^3
I required = 869.4 in^4

Select W24X94 A=27.7 ✓ d=24.3 ✓ tw=0.515 ✓ Zxx=254>231.84 ✓ Ixx=2700 > 231.84 ✓
Check Shear (d * tw * ksi) > Vmax (24.3 * .515 * 50) = 625.7 > 37.35

37.35k each Column
18' each Column
k=1 ∴ KL= 18'
Select HSS 8x8x 1/4

HSS 8x8x¼

AISC pg 1-90

thickness = 0.233
Area = 7.10 in²

wt/ft 25.79#
I = 70.7
S = 17.7
r = 3.15
Z = 20.5

$$KL/r = \frac{1 \times 20.2' \times 12''/ft}{3.15} = 76.95$$

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

$$F_e = \frac{(\pi^2 \times 29{,}000)}{(76.95)^2} = 48.34 > .44(46\ ksi) = 20.24$$

$$F_{cr} = 0.658^{F_y/F_e} \times F_y$$
$$= 0.658^{46/48.34} \times 46\ ksi = 0.658^{.9583} \times 46 ksi$$
$$F_{cr} = 30.8\ ksi$$

$\Phi_c = 0.90$

$\Phi_c \times P_n = \Phi_c \times F_{cr} \times Area$
$= (.9)(30.8) \times 7.10 = 196.81^k$

$196.81^k > 4.1^k$ Ok