

Frames 1-5 (Vertical Column)

Wind loads:

0.53	k/ft for horizontal loads on wall column =	0.044 k/in
0.27	k/ft for horizontal loads on roof beam =	0.023 k/in

Horizontal Wind Loads:

$$[(0.53\text{k/ft} \cdot 24\text{ft}) + (0.27\text{k/ft} \cdot 2.08\text{ft})] = \boxed{13.3 \text{ k}}$$

Vertical Dead Loads:

Assuming roofing & side panels = 1.2 psf + insulation

Roof (12.5ft*26ft)*5psf =	1625 lbs	=	1.625 k
Roof Framing Member	1560 lbs	=	1.56 k
Support Beam @ Crest 1/2(60#/lf)*25=	750 lbs	=	0.75 k
Support Beam @ Eave 1/2(60#/lf)*25=	750 lbs	=	0.75 k
Side Panel (12.5ft*24ft)*10psf =	3000 lbs	=	3 k
Total Dead Load			7.685 k

Roof Live Load (12.5*26 ft) * 20psf	6500 lbs	=	6.5 k
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LRFD Load Combinations Horizontal Loads

1.4D	0 k
1.2D + 1.6L + 0.5L _r	0 k
1.2D + 1.6L _r + 0.8W	10.62528 k
1.2D + 1.6W + 0.5L _r	21.25056 k

LRFD Load Combinations Vertical Loads

1.4D	10.759 k
1.2D + 1.6L + 0.5L _r	12.472 k
1.2D + 1.6L _r + 0.8W	30.24728 k
1.2D + 1.6W + 0.5L _r	33.72256 k

Required Z for Horizontal Loads:

$$21.25056\text{k} \cdot (24/2)\text{ft} = 255.0067 \text{ ft-k} = \frac{3060.081 \text{ in-k}}{(.9 \cdot 50\text{ksi})} = \boxed{68 \text{ in}^3}$$

Beam Selection (Column) according to Z_{req}

W18x40 (Z= 78.4 in³)

Column Geometric Properties:

24ft * 40Plf =	0.96 k	Area=	11.8 in ²
lxx =	612 in ⁴	lyy=	19.1 in ⁴
Sxx =	68.4in ³	Syy=	6.35 in ³
rxx=	7.21 in	ryy=	1.27 in

Frames 1-5 (Roof Beam)

Wind Loads:

0.64 k/lft for vertical roof load = 0.053333 k/in

Loads:

Wind Load	$0.64\text{k/lft} \times (26\text{ft}) =$	16.6 k
Roof Live Load	$(12.5 \times 26\text{ ft}) \times 20\text{psf} =$	6500 lbs = 6.5 k
Roof Dead Load	$(12.5 \times 26\text{ft}) \times 5\text{psf} =$	1625 lbs = 1.625 k
Roof Beam	$60\#/\text{lf} \times 26\text{ft} =$	1560 lbs = 1.56 k
Support Beam @ Crest	$1/2(60\#/\text{lf}) \times 25 =$	750 lbs = 0.75 k
Total Dead Load		2.375 k

LRFD Load Combinations

1.4D	3.325 k
1.2D + 1.6L + 0.5L _r	6.1 k
1.2D + 1.6L _r + 0.8W	26.562 k
1.2D + 1.6W + 0.5L _r	32.724 k

Required Z:

$32.724\text{k} \times (26/2) \times \text{ft} = 425.412\text{ ft-k} = \frac{5104.944\text{ in-k}}{(.9 \times 50\text{ksi})} = \mathbf{113.4432\text{ in}^3}$

Beam Selection according to Z_{req}

W18x60 (Z = 123 in³)

Geometric Properties:

Beam Weight	$26\text{ft} \times 60\text{Plf} =$	1.56 k	A =	17.6 in ²
	I _{xx} =	984 in ⁴	I _{yy} =	50.1 in ⁴
	S _{xx} =	108 in ³	S _{yy} =	13.3 in ³
	r _{xx} =	7.47 in	r _{yy} =	1.68 in