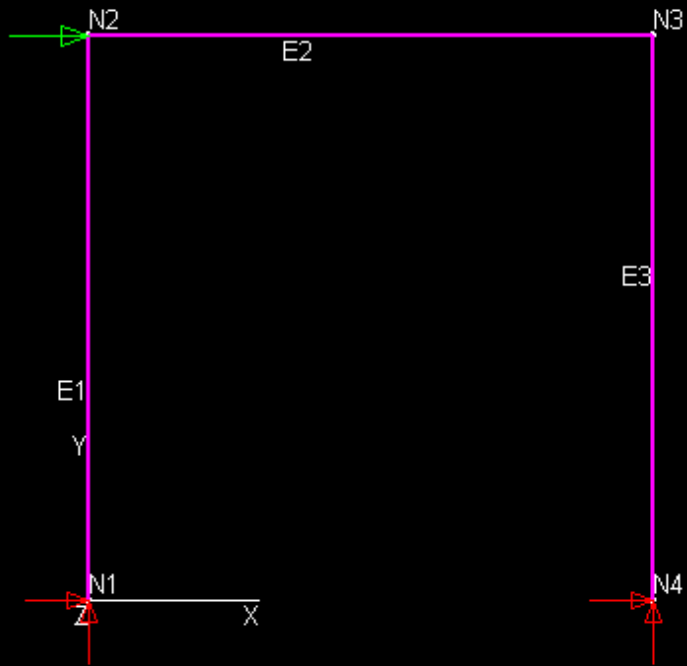
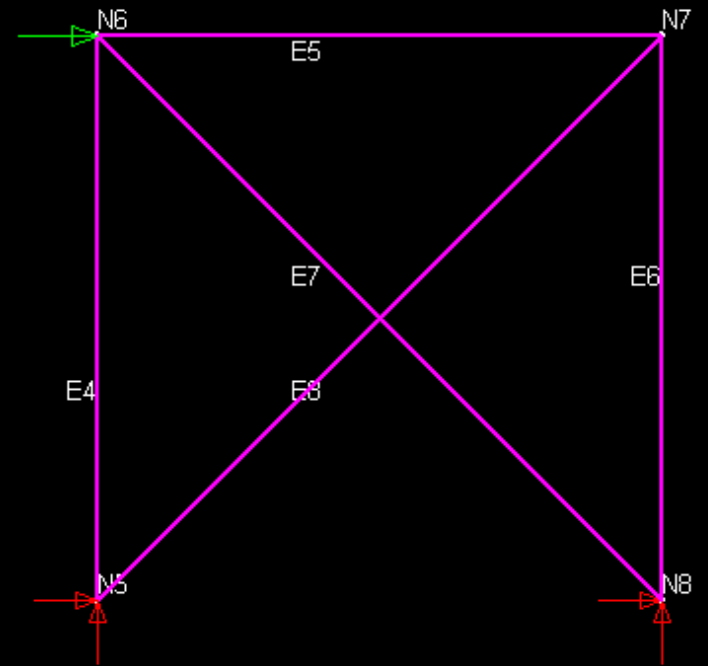


Frame



Braced frame



Define element(s) and parameters

Element(s):

All

All

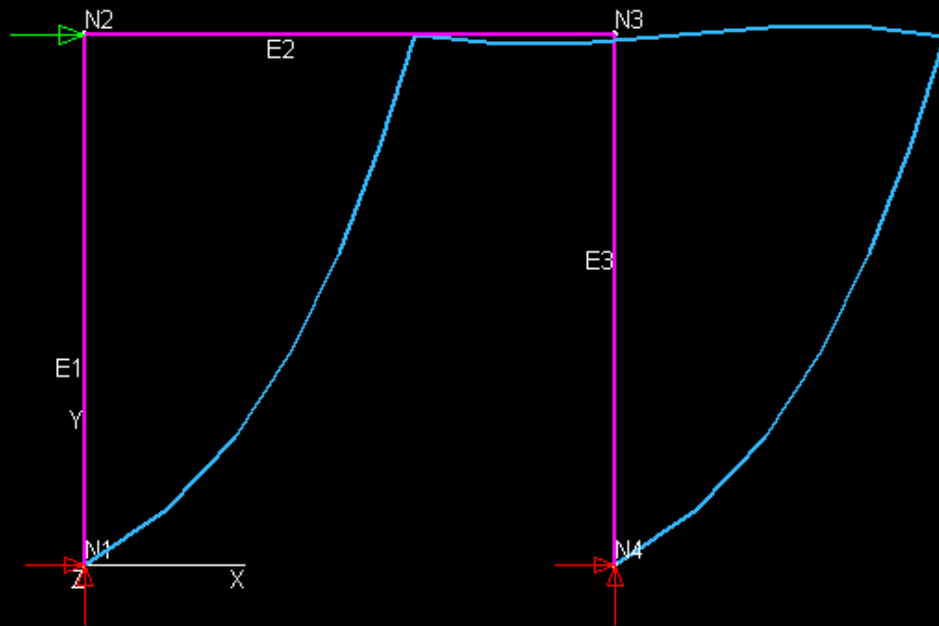
Clr

Status:

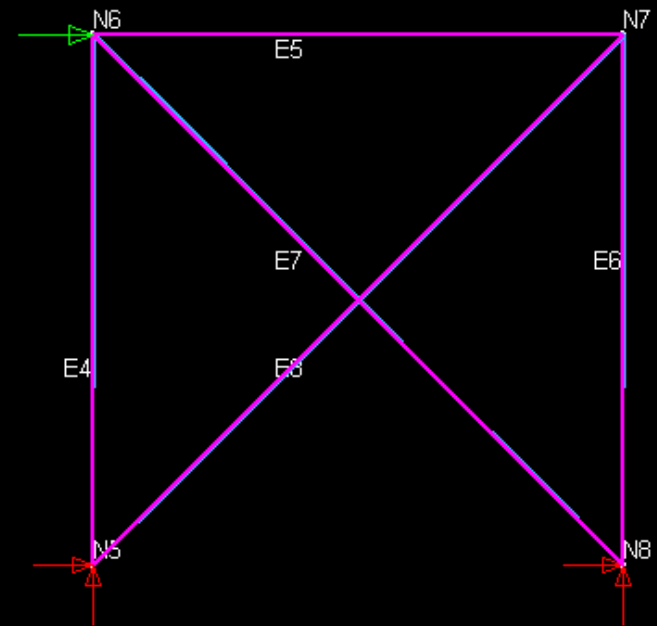
Success: Deflection shown

2.5 Def Line Type D Scale 0.5 # of pts 5 < 1 > Apply Cancel

Frame



Braced frame



Define element(s) and parameters

Element(s):

All

All

Clr

Status:

Success: Deflection shown

S

Defl Line Type

D

Scale

0.5

of pts

5

<

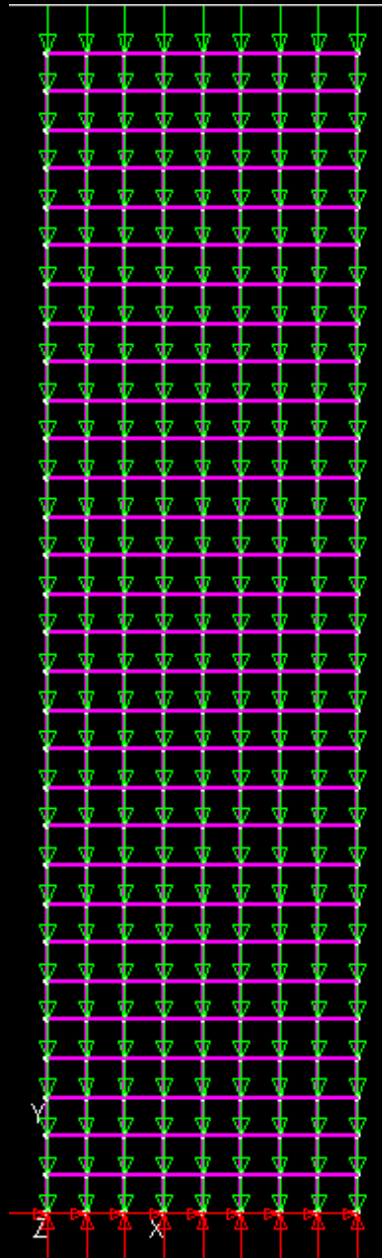
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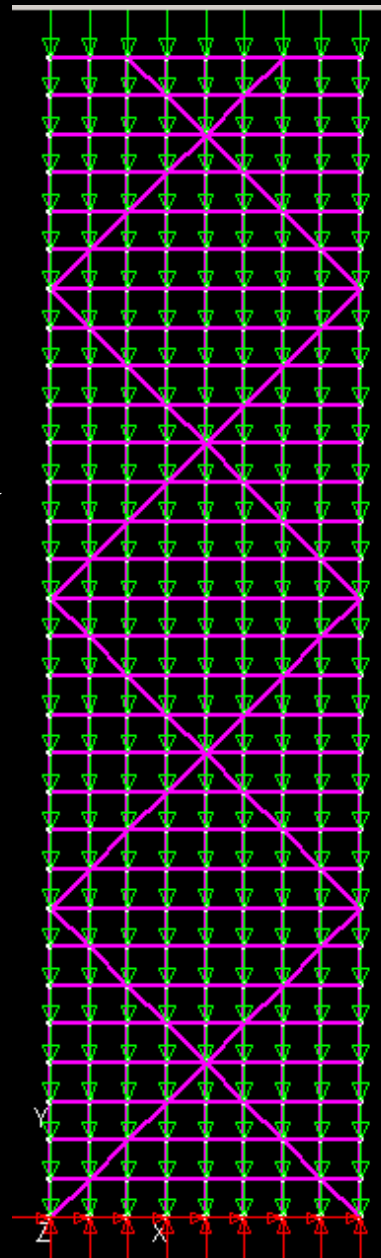
Apply

Cancel

Frame

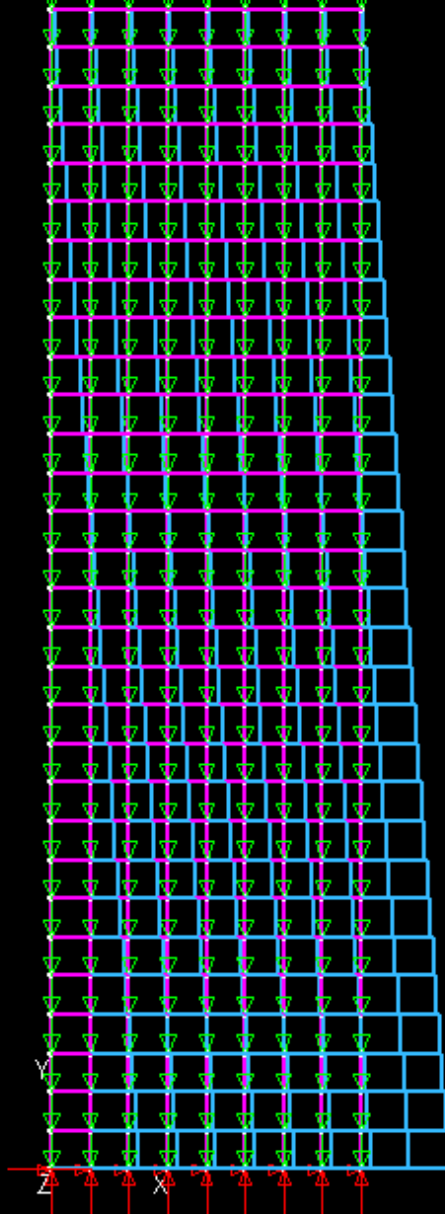


Braced frame



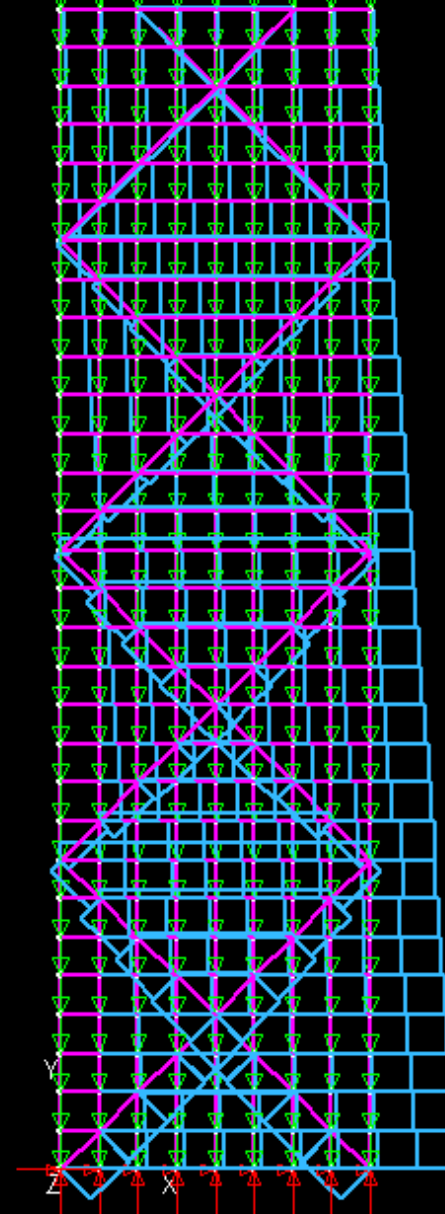
Frame

1st-Order Elastic, Incr # 1, Applied Load Rati

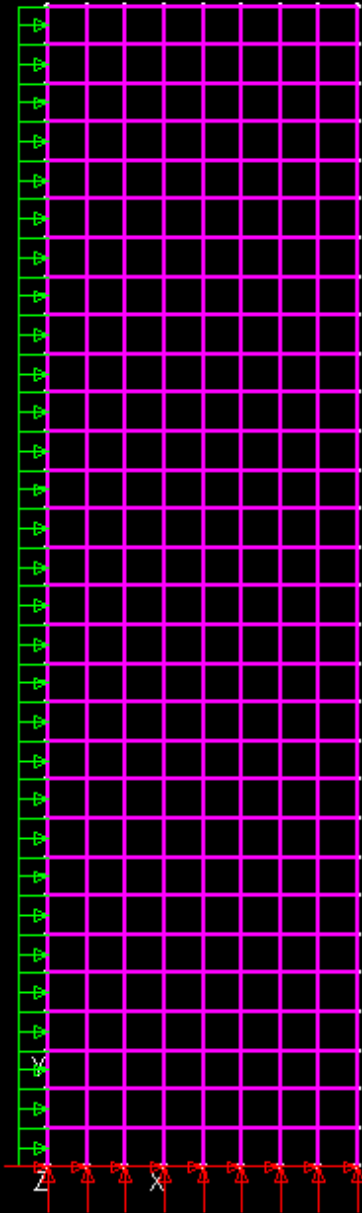


Braced frame

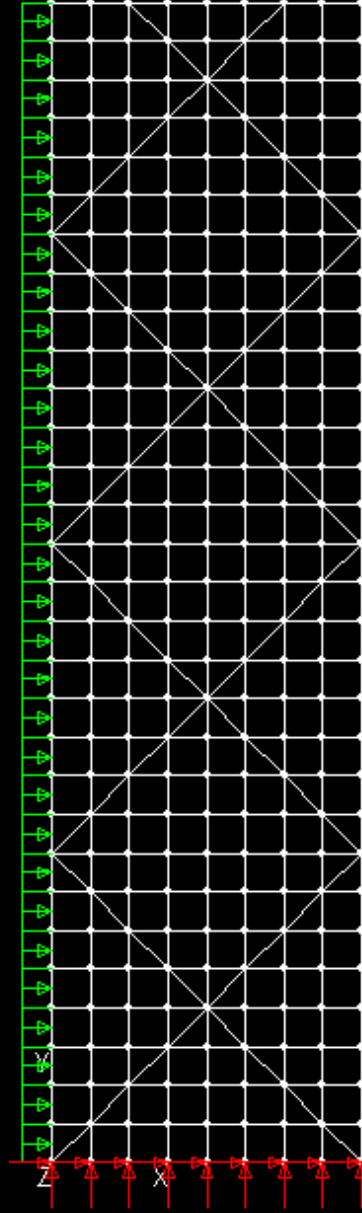
1st-Order Elastic, Incr # 1, Applied Load Ra



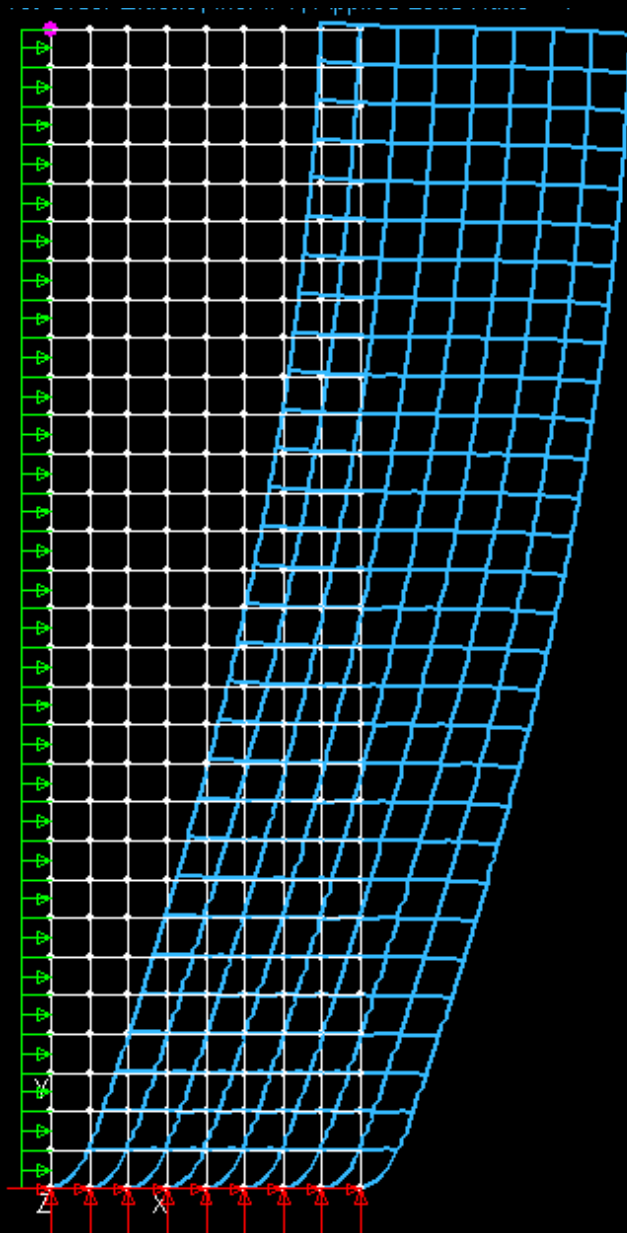
Frame



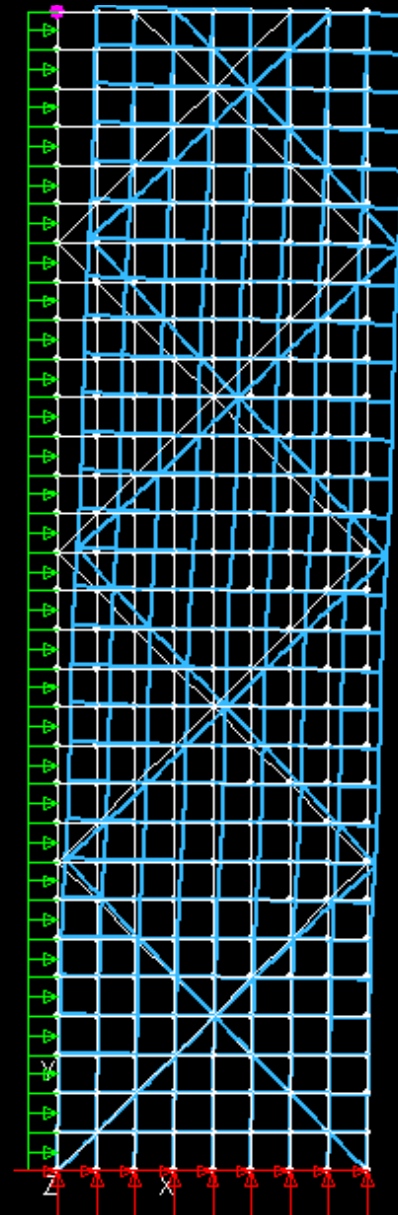
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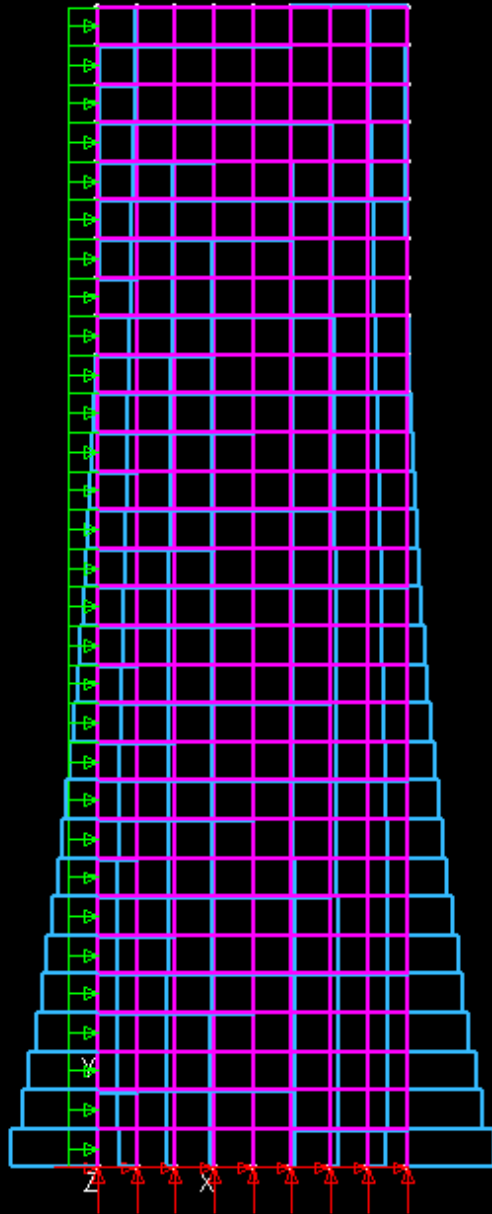
Frame



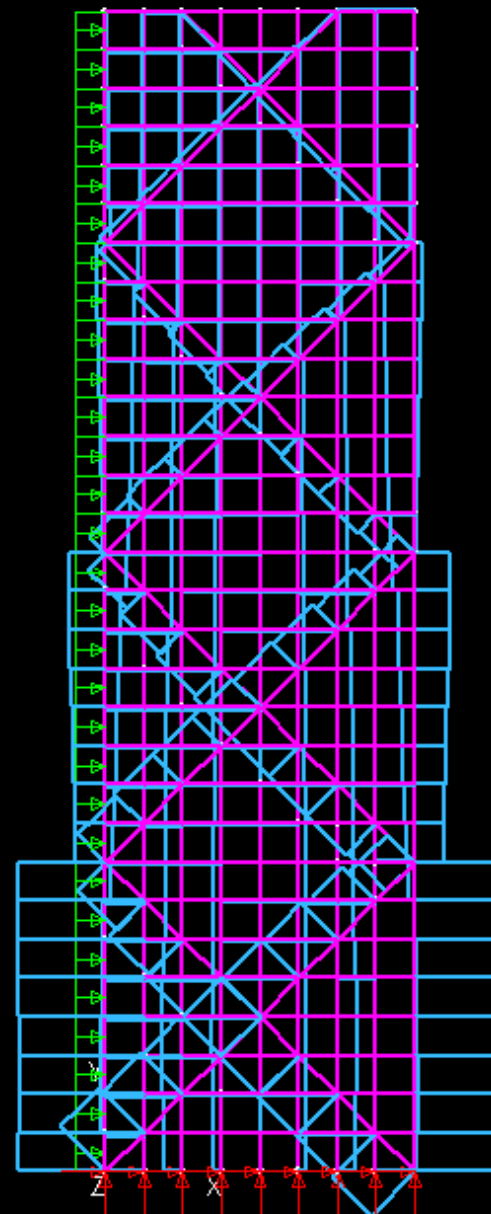
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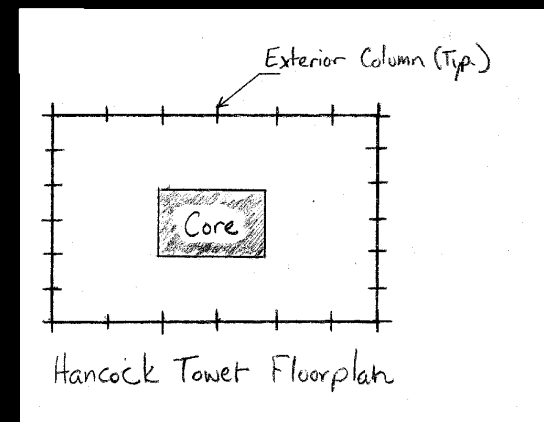
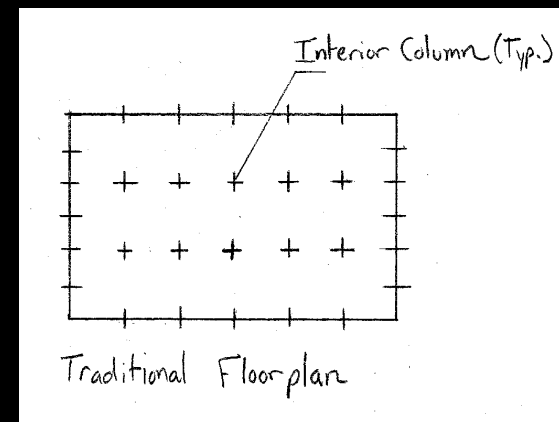
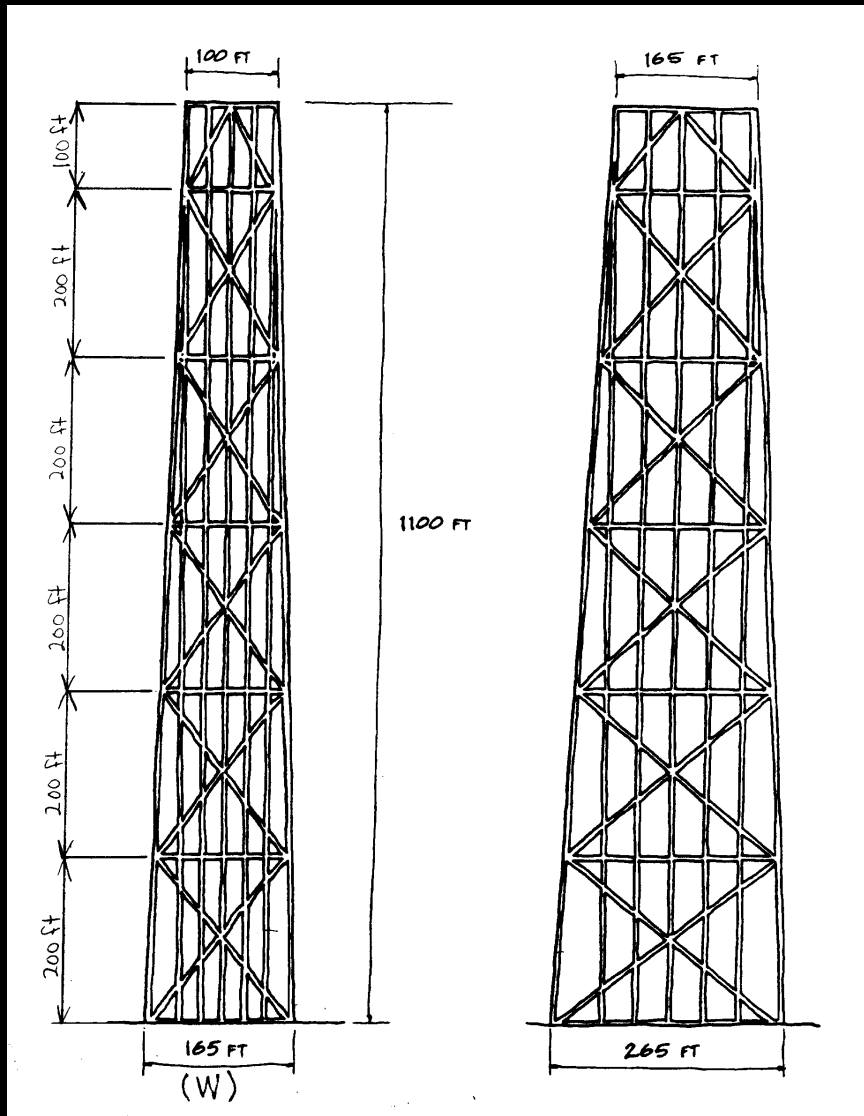
Frame



Braced frame

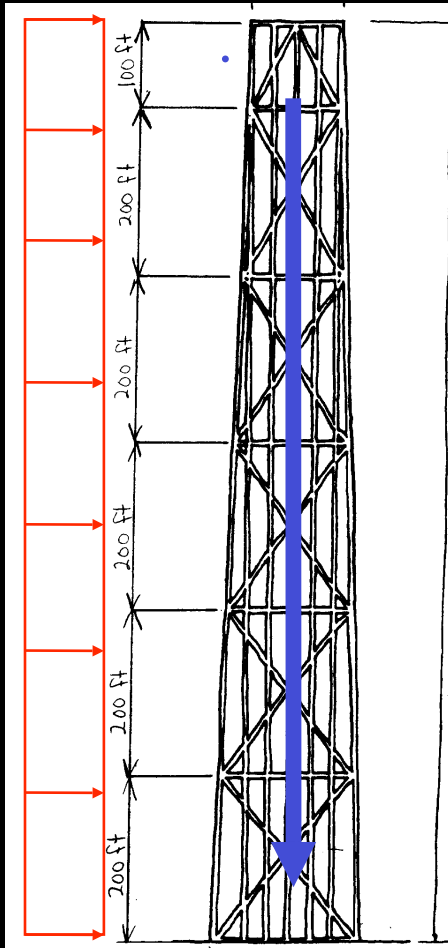


- Objective:
- (1) Calculate column forces due to wind and gravity
 - (2) Find structural factor of safety



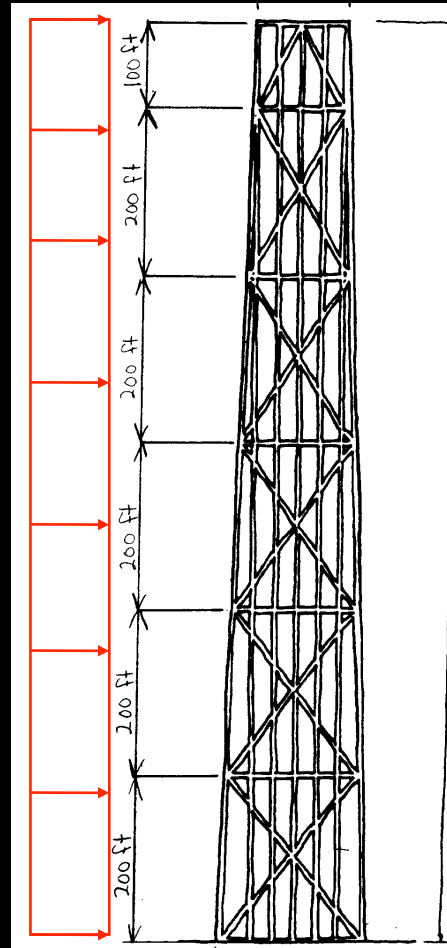
Superposition

wind Grav



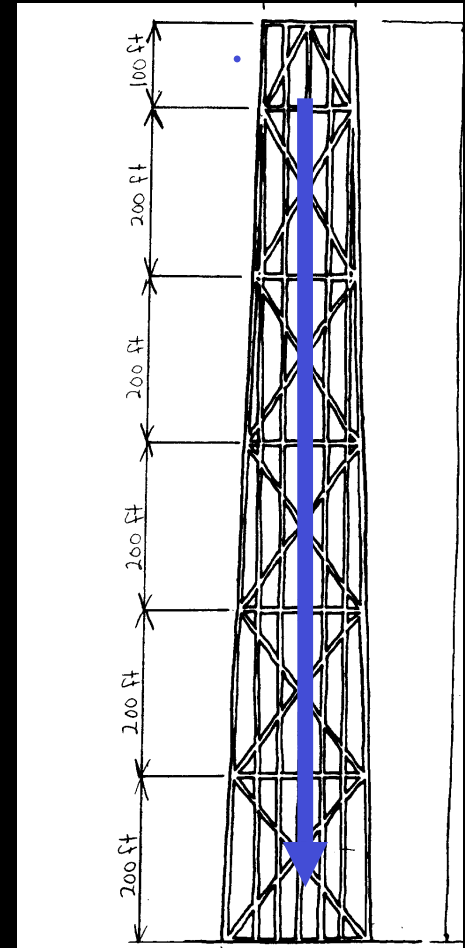
=

wind

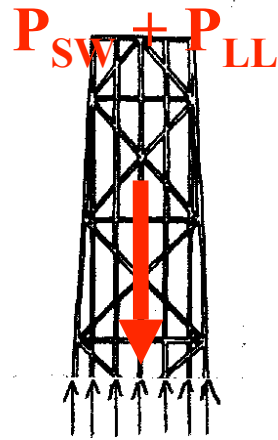


+

Grav



Gravity Load



General Equation:
Axial Force per Column (SW+LL)

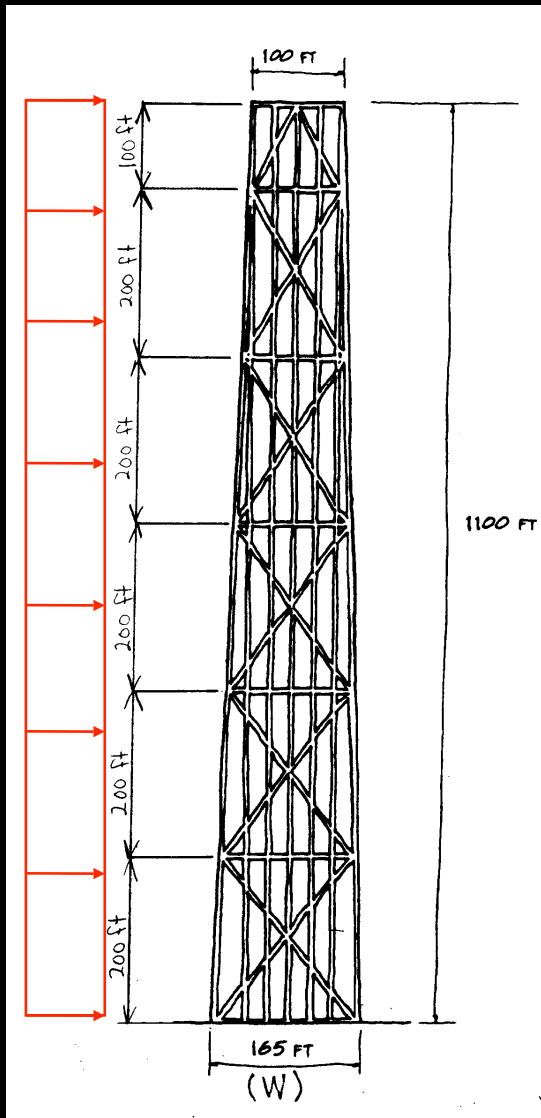
$$F_G = \frac{P_{SW} + P_{LL}}{24} \times 0.5$$

(See Figure 3 for P_{SW} and P_{LL})

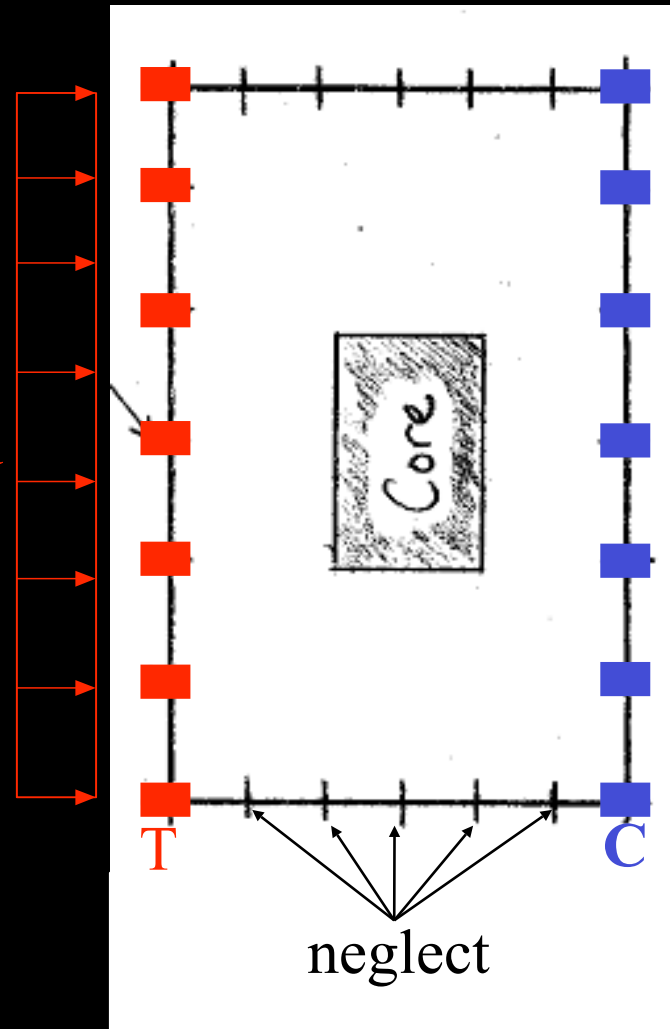
- Assumptions: (1) Gravity load shared equally between core and tube
(2) Gravity load shared equally among all 24 columns

Wind Load

wind



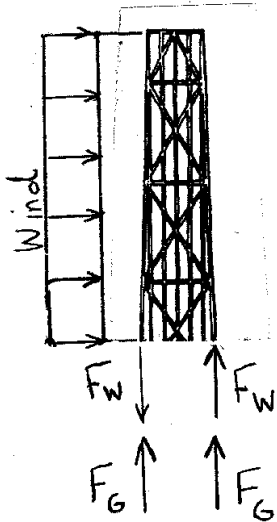
wind



Assumptions: (1) All wind resisted by trussed tube
(2) All wind resisted by perpendicular faces

Safety Factor

Safety factor gives the ratio of allowable force to the force demanded by the loads



General Equations:

Factor of Safety (FS)

$$FS_{\max} = \frac{F_A}{F_G - F_W}$$

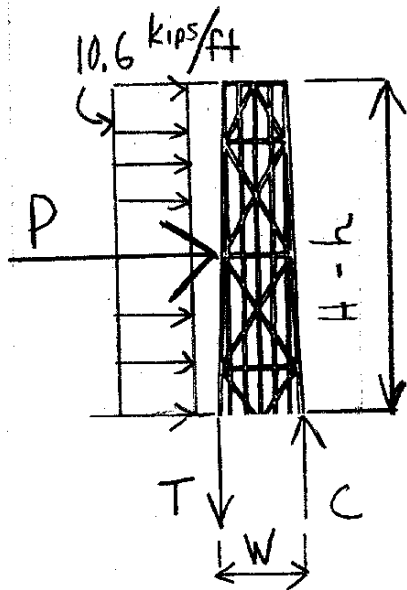
$$FS_{\min} = \frac{F_A}{F_G + F_W}$$

where $F_A = 35000$ kips
is the allowable axial
force in one column

Note:

$$F_A = \underbrace{20 \text{ kips/in}^2}_{\text{allowable stress}} \cdot \underbrace{1750 \text{ in}^2}_{\text{area of one column}}$$

Column Forces



General Equations:
Axial Force per Column (Wind)

$$P = (10.6 \text{ k/ft})(H-h)$$

where H = tower height

$$M = \frac{P(H-h)}{2}$$

h = height of section from ground

$$C = -T = \frac{M}{W}$$

$$F_w = \frac{C}{7} \quad \left(\text{Axial force per column from wind} \right)$$