

# ***Structure***

# Structure

- **Resist self-weight and imposed loads w/o excessive deformations**
- **Structural Load Classifications**
  - **Dead (self weight of built-in items)**
  - **Live (occupancy, wind, earthquake, traffic, etc)**
- **More useful**
  - **Lateral loads (wind, EQ)**
  - **Vertical loads (gravity)**



jfstraube1998

# Oldest House in North America - (Sante Fe)

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**Hybrid infill**

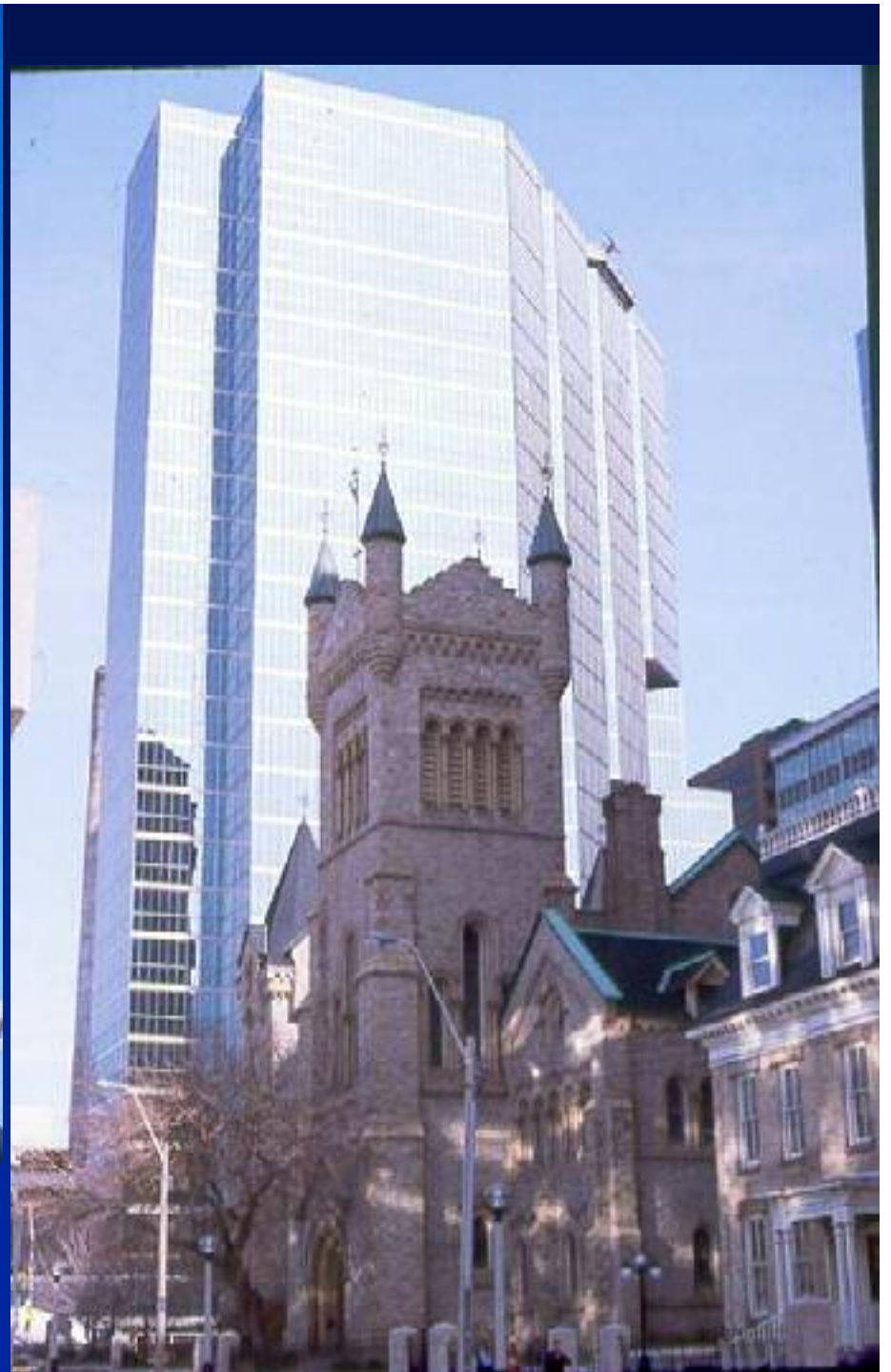












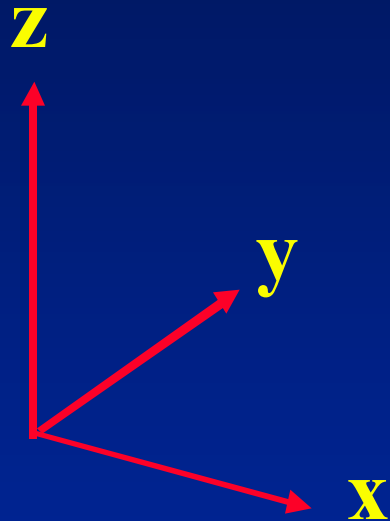






# Resolve Loads

- Lateral Loads
- Gravity Loads

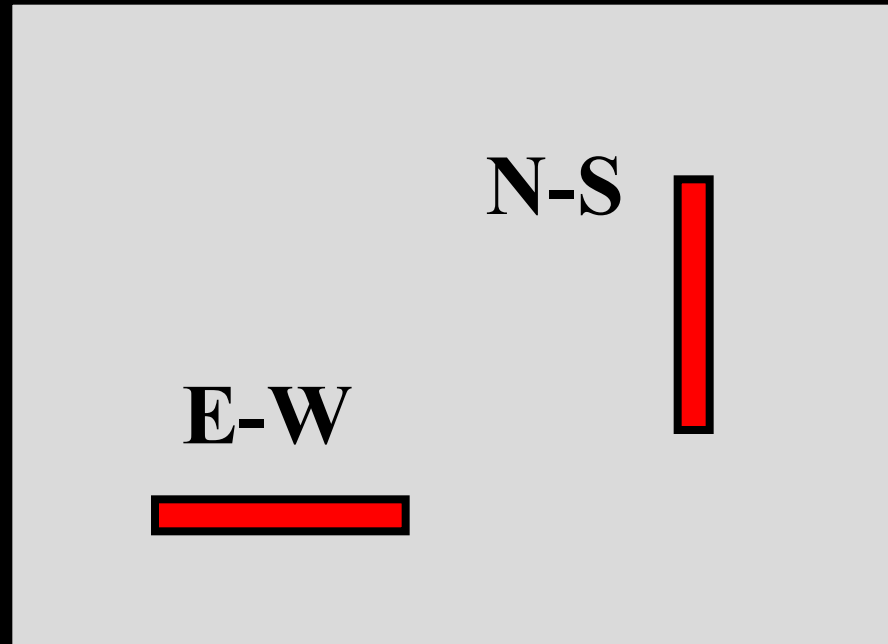


*Then*

- Structure - frame, shear wall
- Element - beam
- Section - I, circle, square
- Material - wood, steel, conc

# Lateral Loads

**Provide resistance in two perpendicular directions**

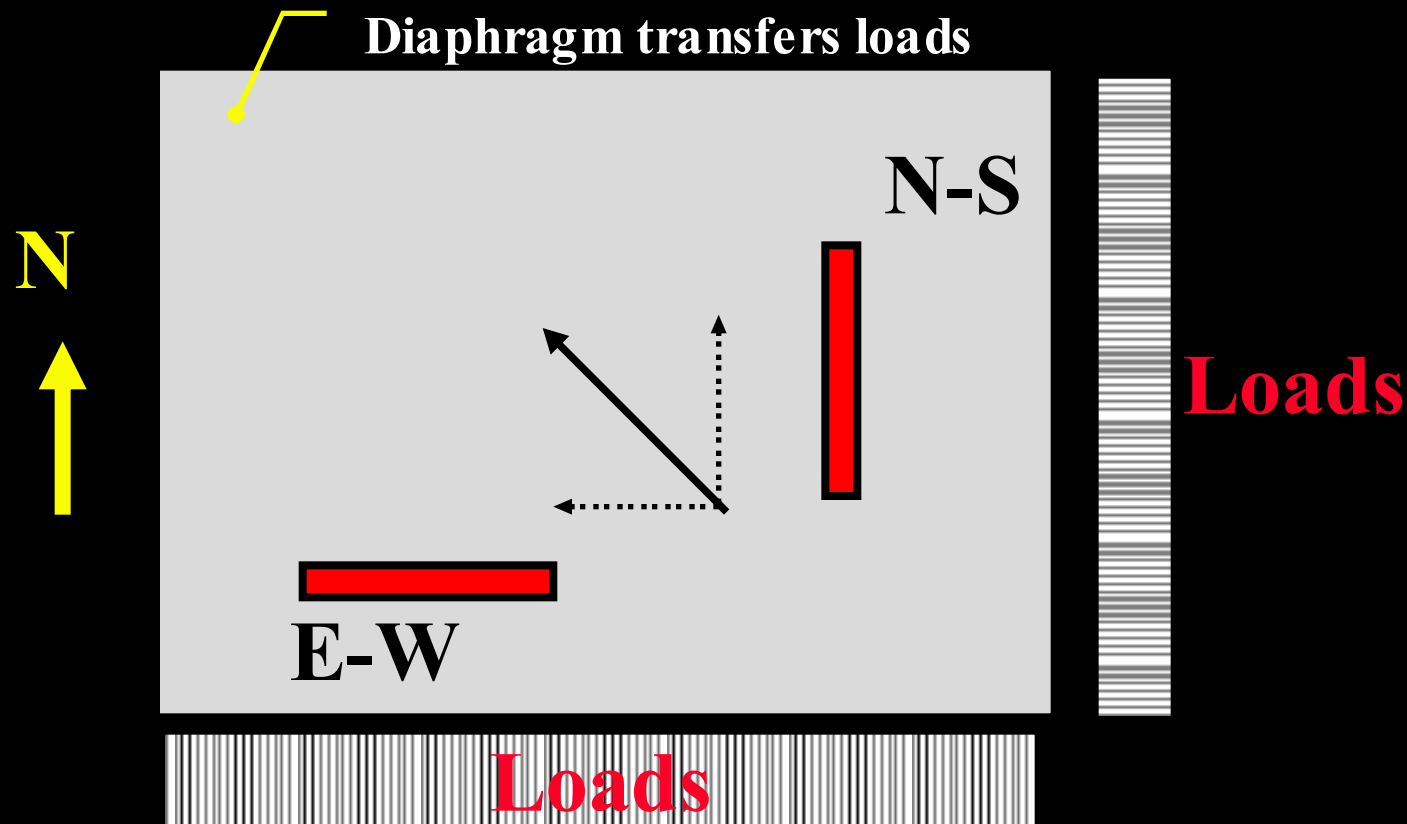


**Plan View**



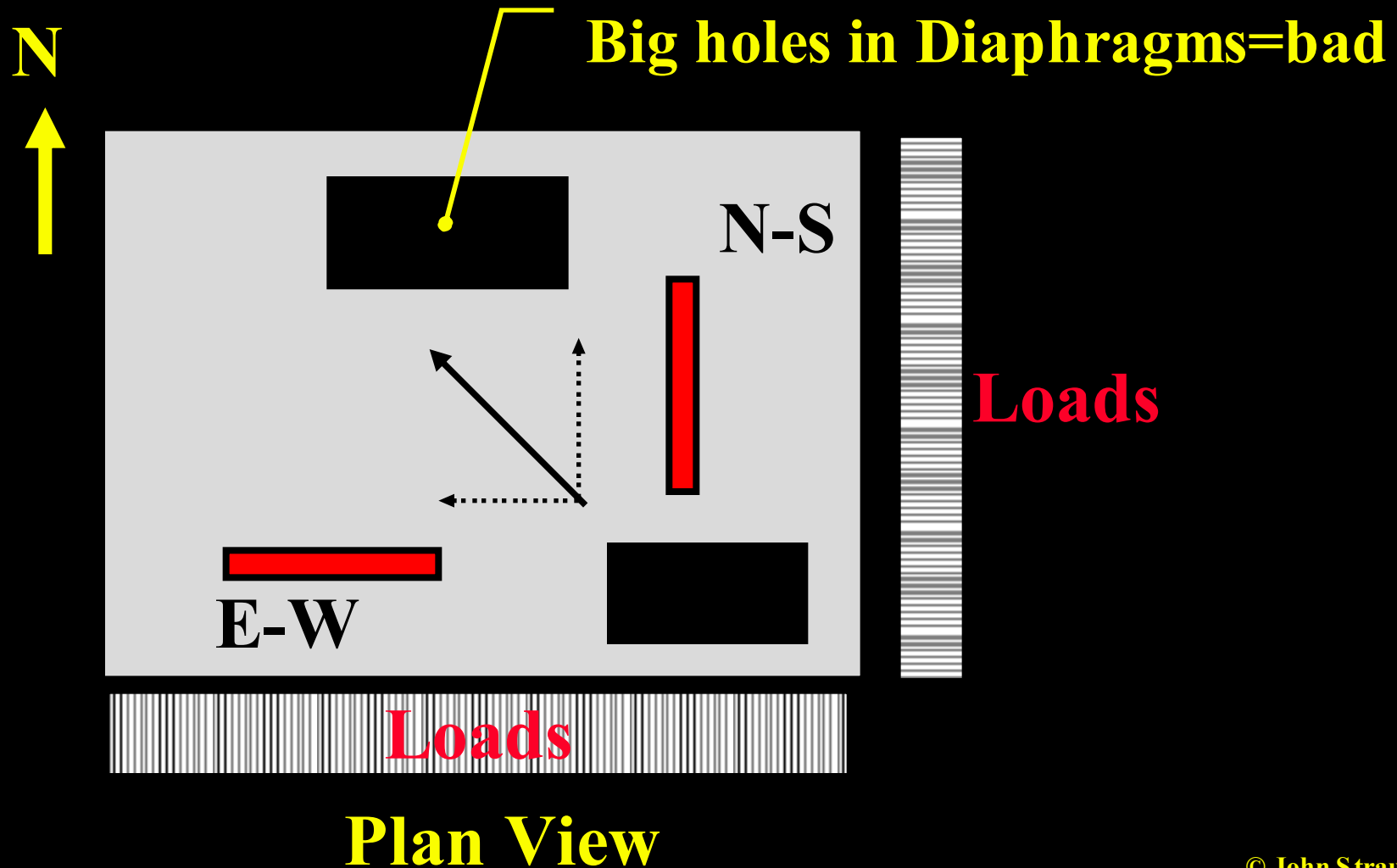
# Lateral Loads

## Diagonal Loads are Shared



**Plan View**

# Lateral Loads: Diaphragms



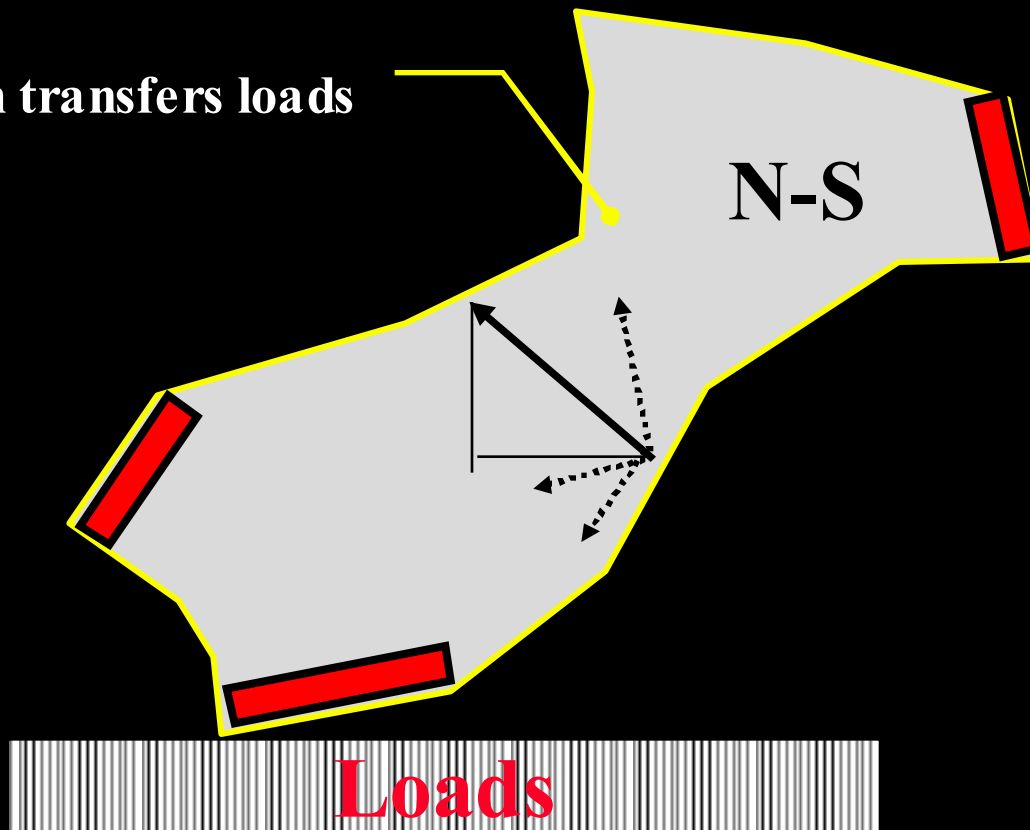


# Lateral Loads: Odd Shapes

**Provide resistance in two perpendicular directions**

Diaphragm transfers loads

N  
↑

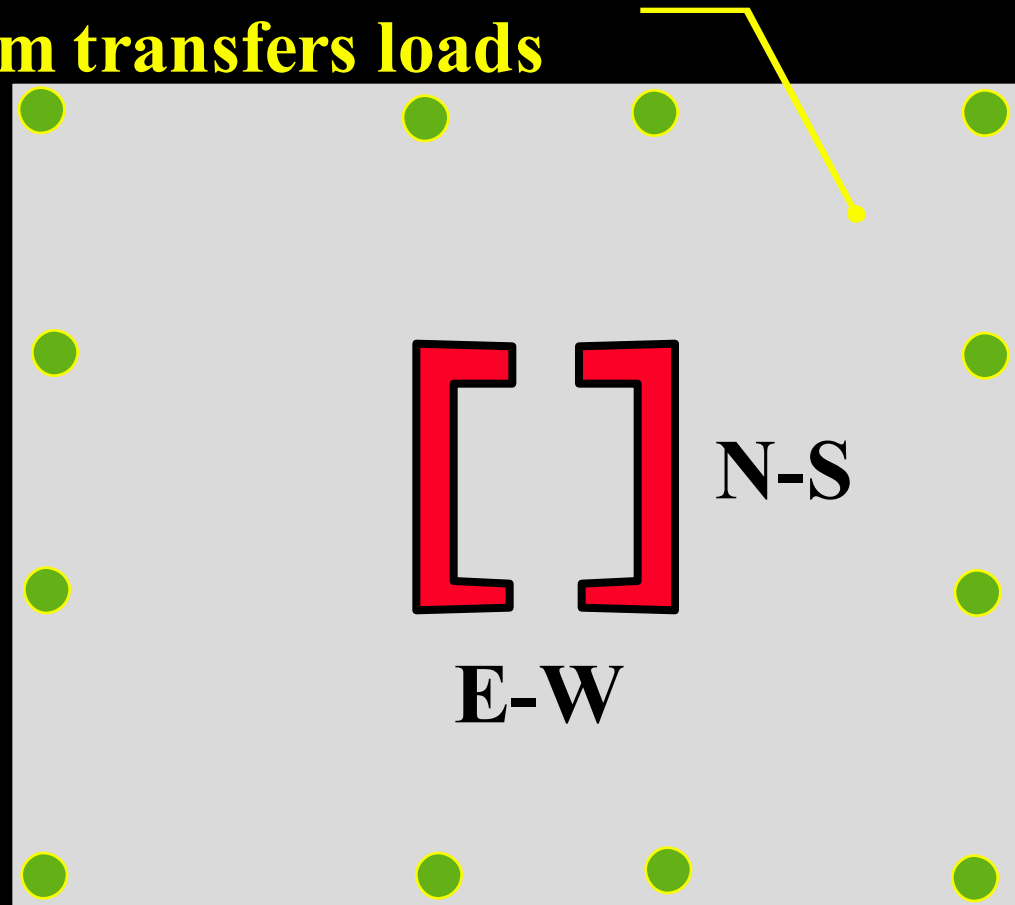


Loads

Loads

# Lateral Load Resisting Systems

**Diaphragm transfers loads**



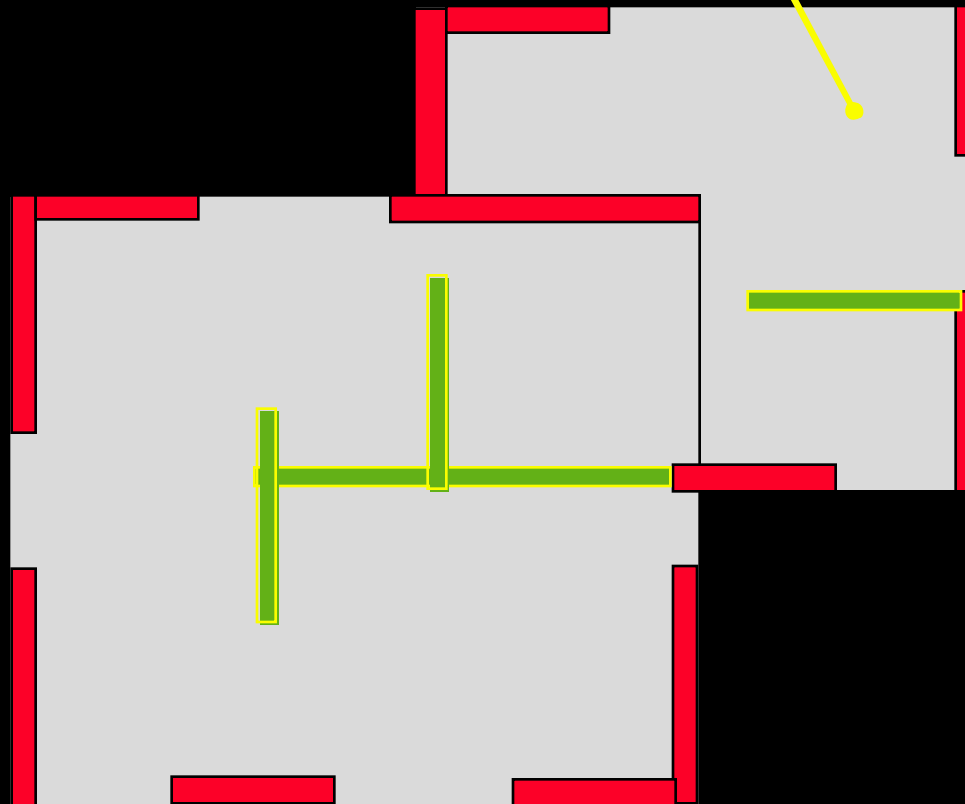
**Classic  
Office  
Bldg**

**Plan View**



# Lateral Load Resisting Systems

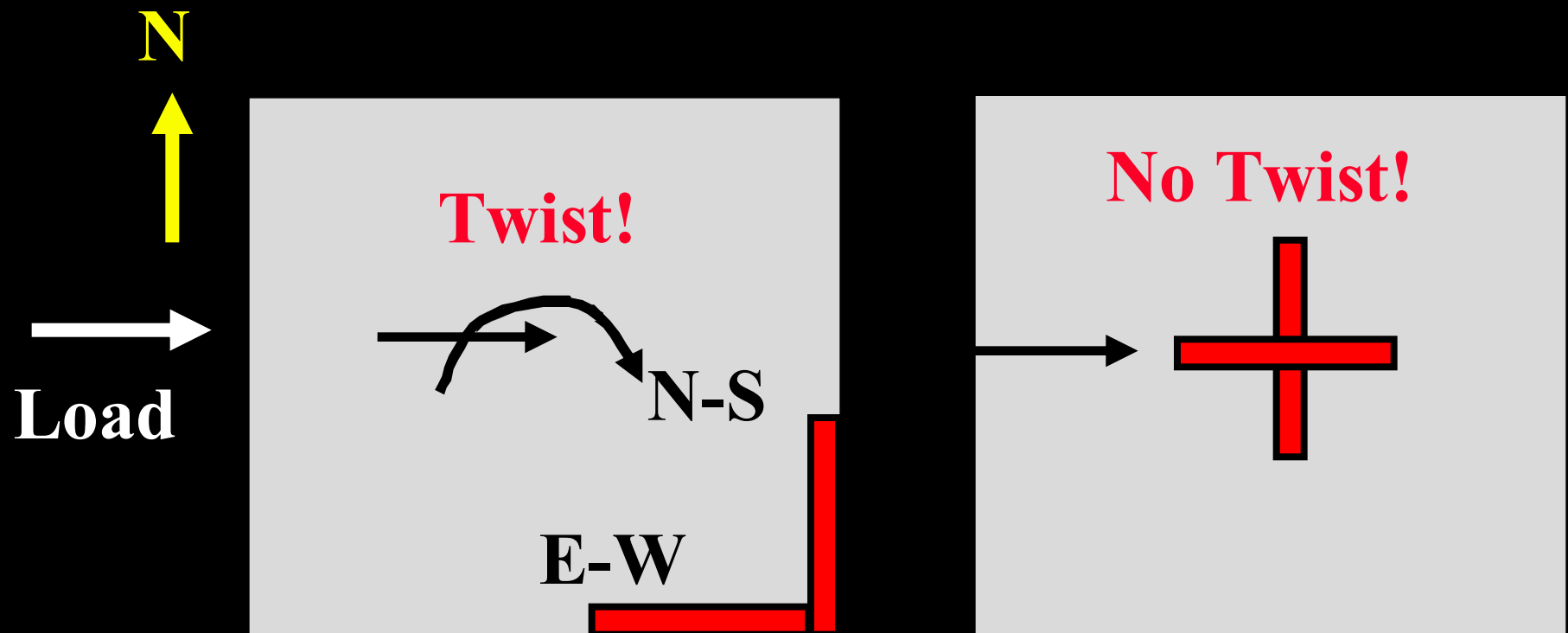
**Diaphragm transfers loads**



**Classic  
Small  
Bldg**

**Plan View**

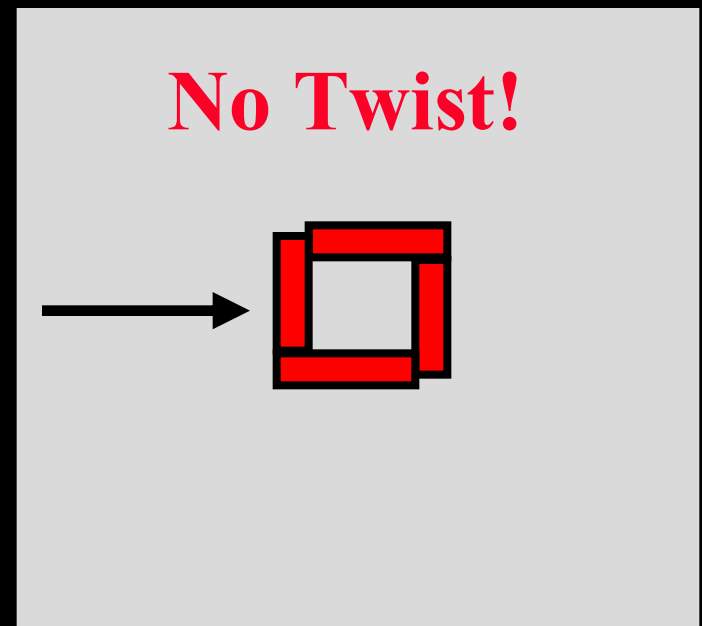
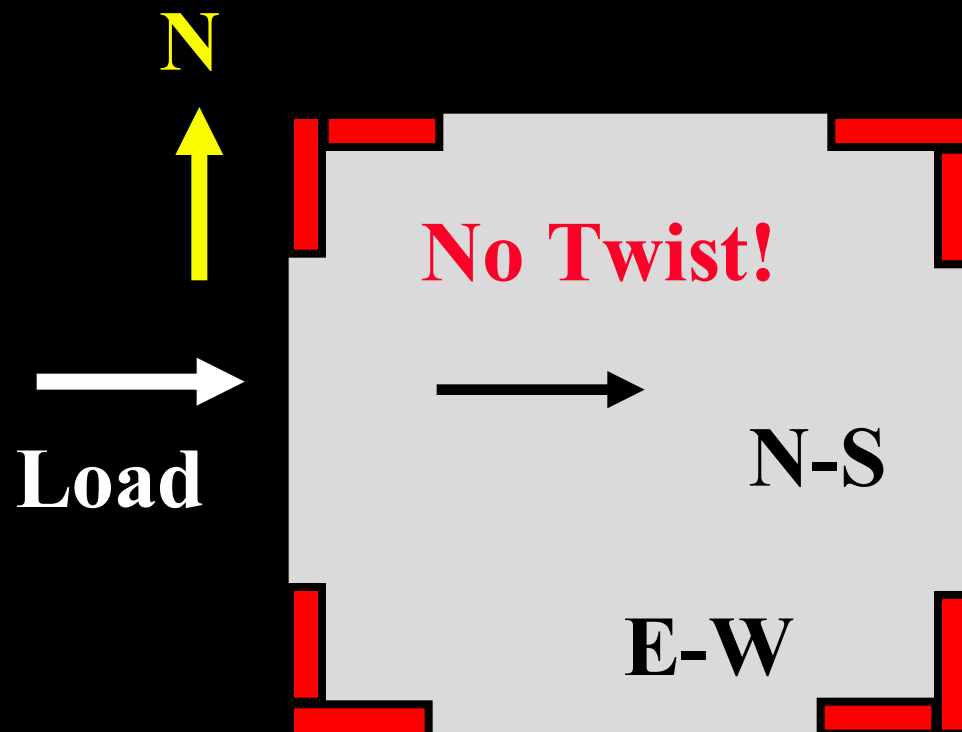
# Lateral Loads: Eccentricity



**Plan View**

# Lateral Loads: Eccentricity

**Provide Symmetry if possible**

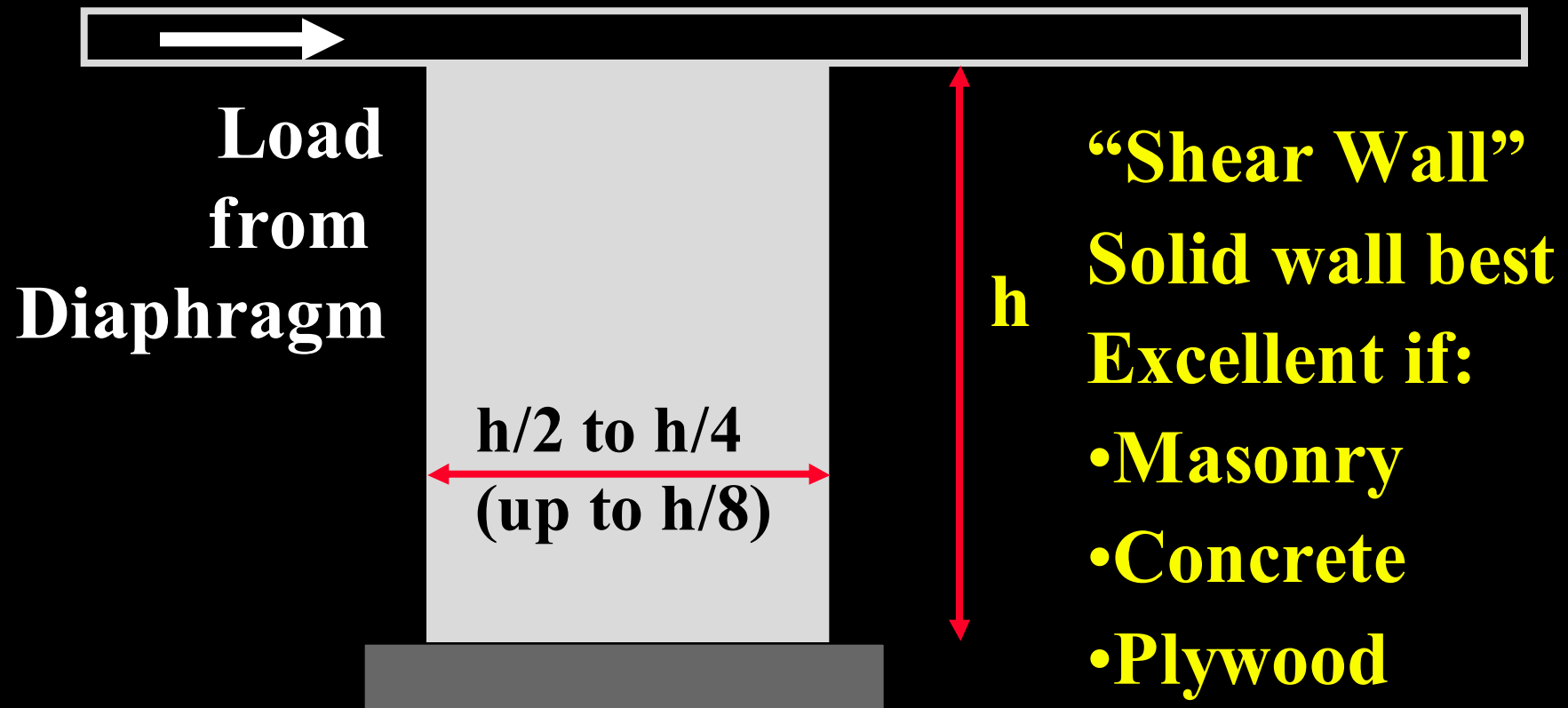


**Plan View**



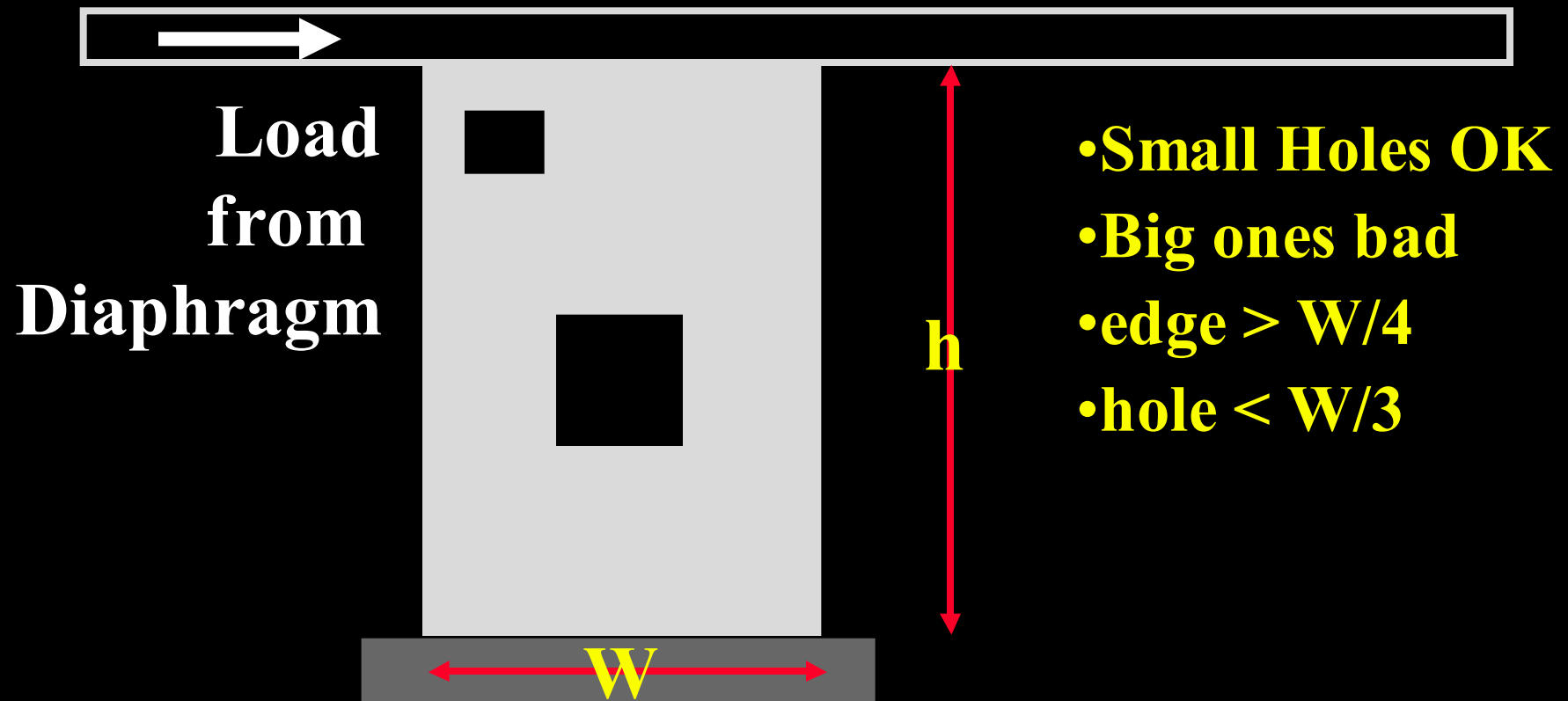
# Lateral Load Resisting Elements

What are these            things anyway?



**Elevation View**

# Shear Wall Penetrations



Elevation View

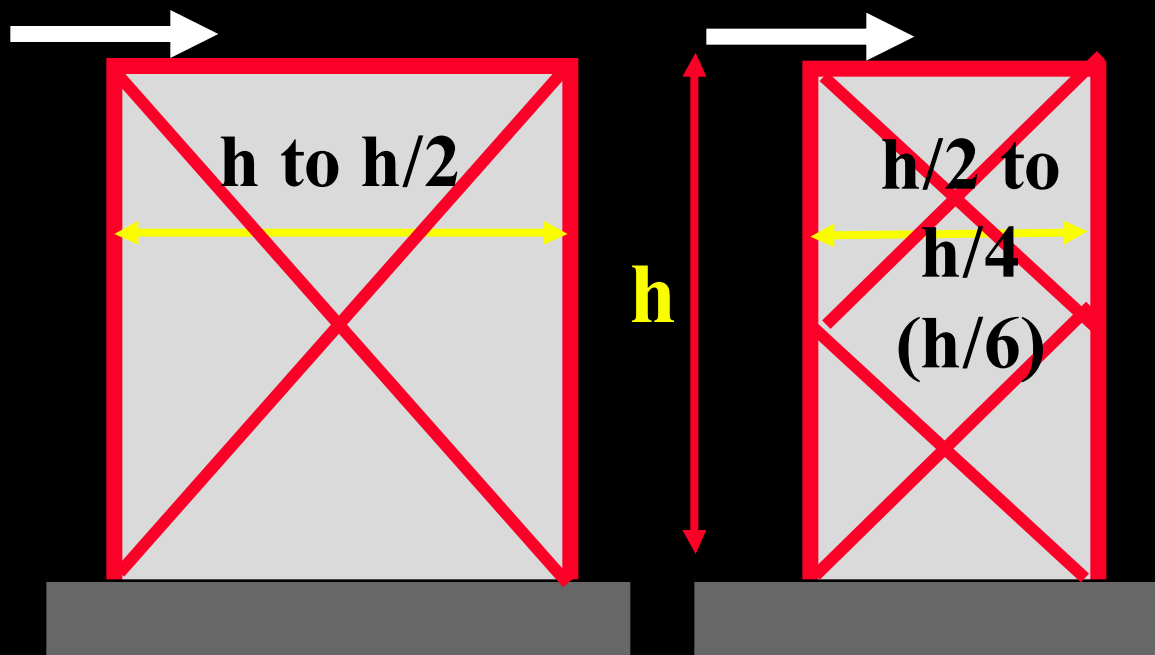
# Lateral Load Resisting Elements





# Lateral Load Resisting Elements

Load from Diaphragm



Elevation View

**“Braced Wall”**

**Good if:**

- **Steel**
- **Steel+Wood**

# Lateral Load Resisting Elements



# Lateral Load Resisting Elements









# Lateral Load Resisting Elements



















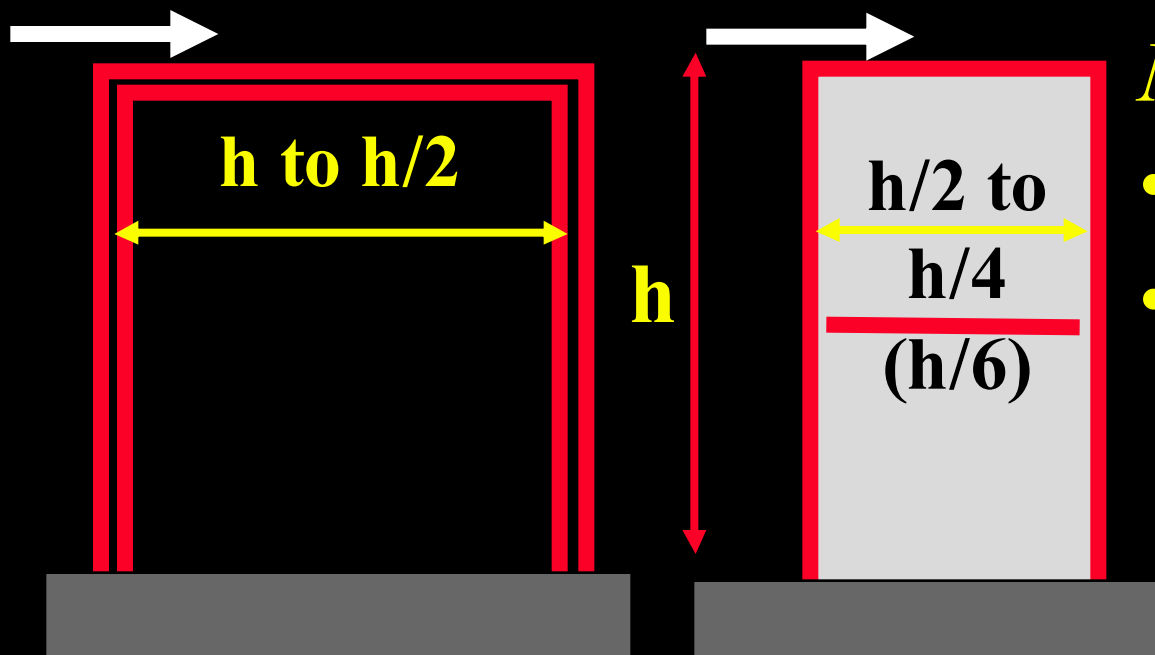






# Lateral Load Resisting Elements

Load from Diaphragm



Elevation View

**“Moment Frame”**

- **Expensive**
- **Flexible**

*Materials:*

- **Steel**
- **Reinforced Conc**





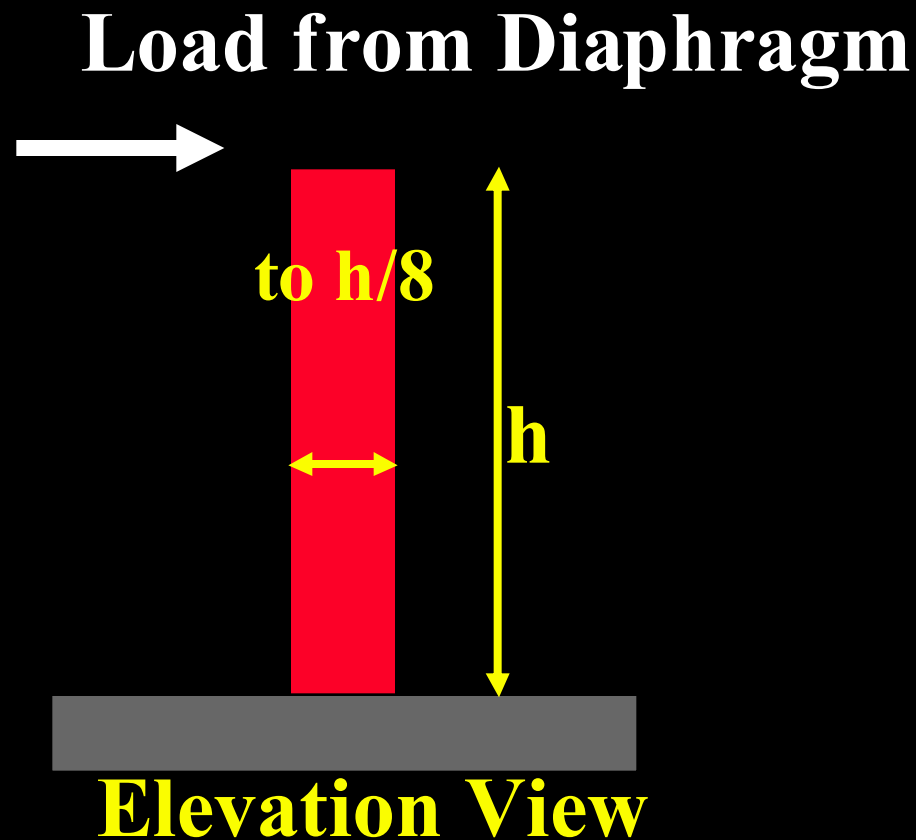




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# Lateral Load Resisting Elements



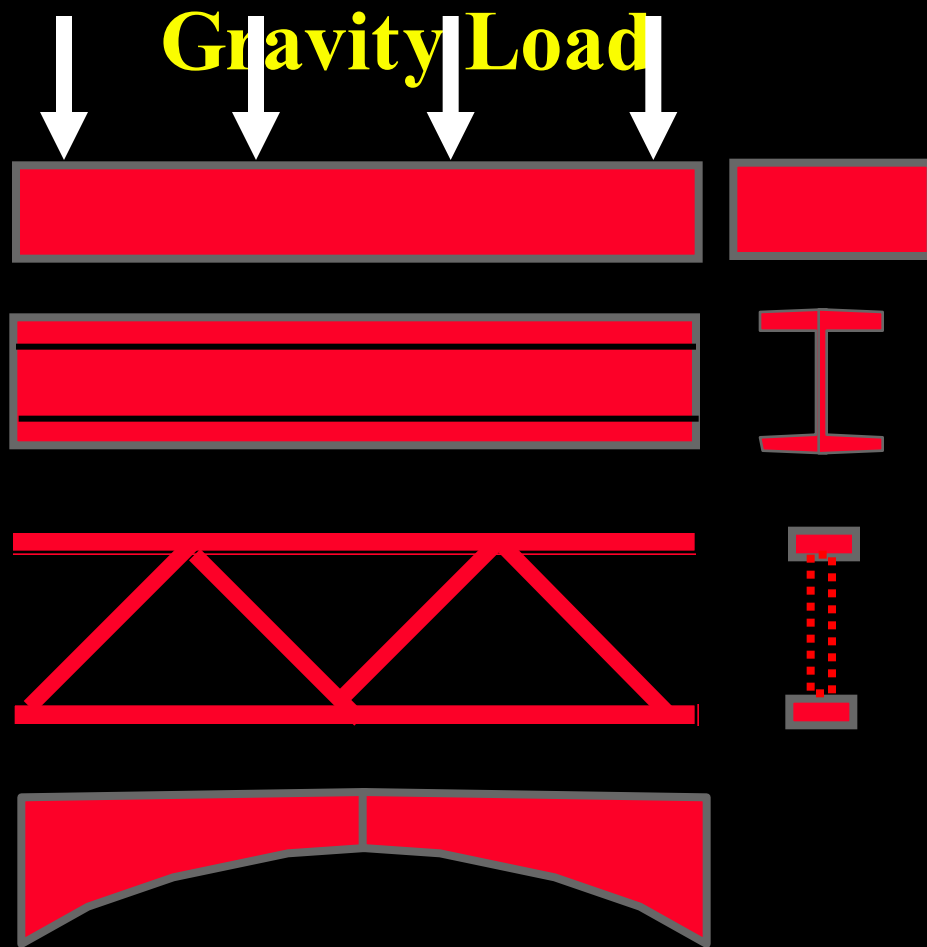
## “Cantilever Post”

- One Story
- Flexible
- Expensive

### *Materials:*

- Wood
- Steel
- Reinforced Conc

# Gravity Load Resisting Elements



**Slabs  $d=L/20-L/40$**

**Beams  $=L/12 - L/25$**

**Trusses  $=L/6 - L/12$**

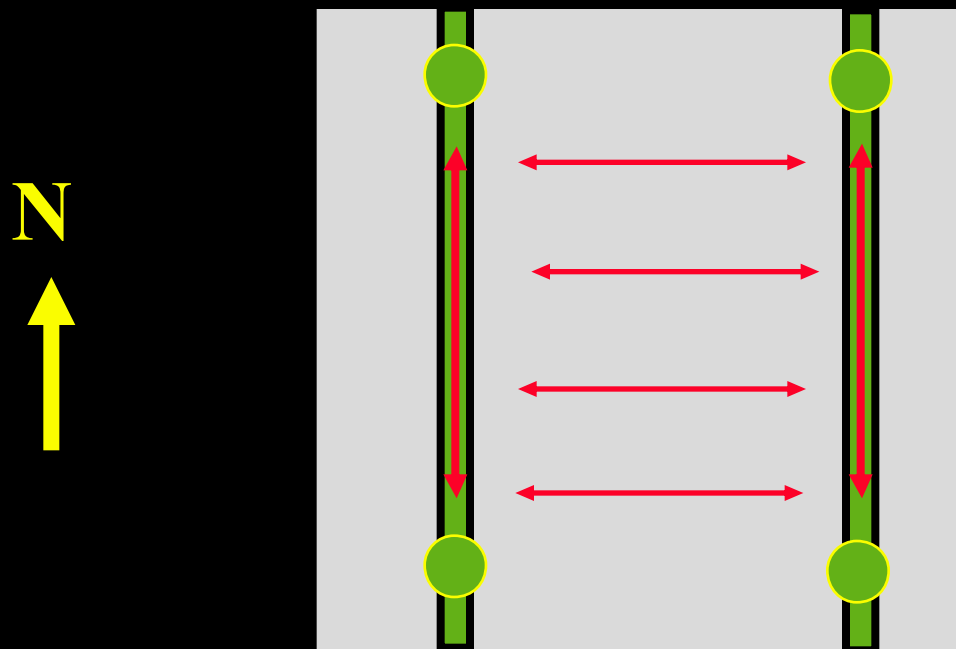
**Arches  $= L/3 - L/8$**

**Side View**

**End View**

# Pick Load Path

**Load Can Flow in One-Direction or Two**



**Plan View**

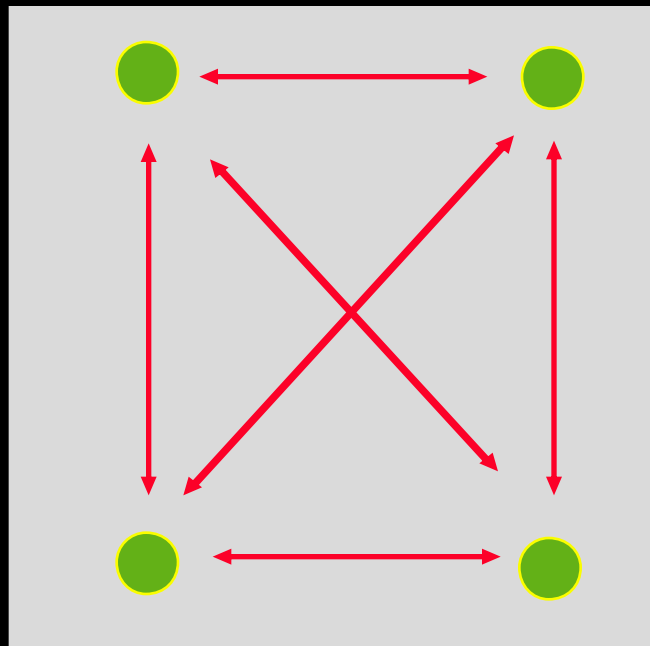
- System A in E-W
- System B in N-S
- Then Columns or Walls to ground

- Easy & Common
- Steel, conc, wood

# Pick Load Path

**Load Goes Both Ways = 2 way system**

**N**  
↑



**Plan View**

**•If E-W:N-S dimensions  
>2:1 then one-way**

**Practical for**

- Concrete**
- Space frame  
(steel, wood)**





