Pinned Frames

- structures with at least one 3 force body
- connected with pins
- reactions are equal and opposite
  - non-rigid
  - rigid

Rigid Frames

- rigid frames have no pins
- frame is all one body
- typically statically indeterminate
- types
  - portal
  - gable

Rigid Frames with PINS

- frame pieces with connecting pins
- not necessarily symmetrical
Internal Pin Connections

• statically determinant
  – 3 equations per body
  – 2 reactions per pin + support forces

Arches

• ancient
• traditional shape to span long distances

Arches

• primarily sees compression
• a brick “likes an arch”

• behavior
  – thrust related to height to width
Three-Hinged Arch

- statically determinant
  - 2 bodies, 6 equilibrium equations
  - 4 support, 2 pin reactions (= 6)

Procedure

- solve for all support forces you can
- draw a FBD of each member
  - pins are integral with member
  - pins with loads should belong to 3+ force bodies
  - pin forces are equal and opposite on connecting bodies
  - identify 2 force bodies vs. 3+ force bodies
  - use all equilibrium equations

Compound Beams

- statically determinant when
  - 3 equilibrium equations per link =>
  - total of support & pin reactions (properly constrained)
- zero moment at pins

Rigid Body Types

- two force bodies
  - forces in line, equal and opposite
- three force bodies
  - concurrent or parallel forces
Continuous Beams
• statically indeterminate
• reduced moments than simple beam

Continuous Beams
• loading pattern affects
  – moments & deflection

Continuous Beams
• unload end span

Continuous Beams
• unload middle span
Analysis Methods

• Approximate Methods
  – location of inflection points

• Force Method
  – forces are unknowns

• Displacement Method
  – displacements are unknowns

Two Span Beams & Charts

• equal spans & symmetrical loading
• middle support as flat slope