

**ARCHITECTURAL STRUCTURES I:
STATICS AND STRENGTH OF MATERIALS**

ENDS 231

DR. ANNE NICHOLS

SUMMER 2006

**lecture
eight**

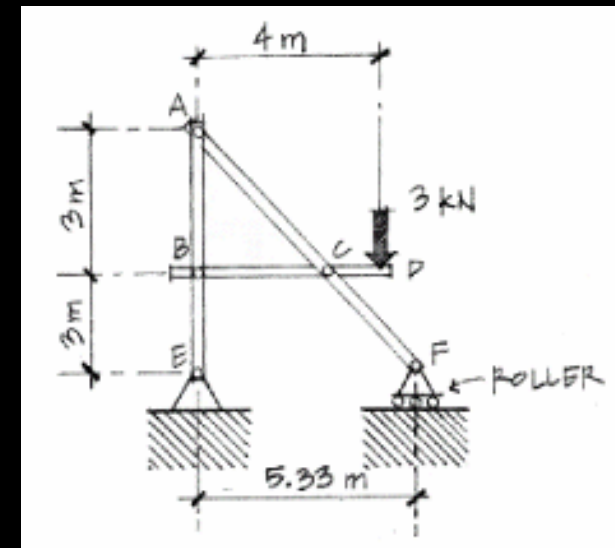
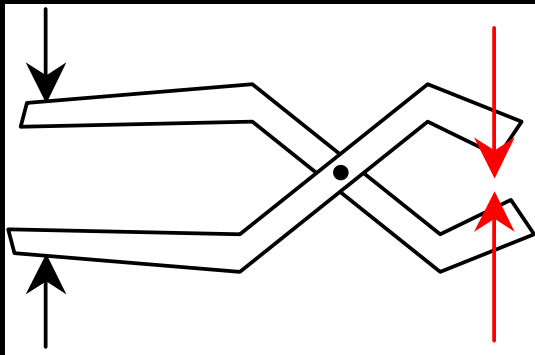
pinned frames

hinged arches



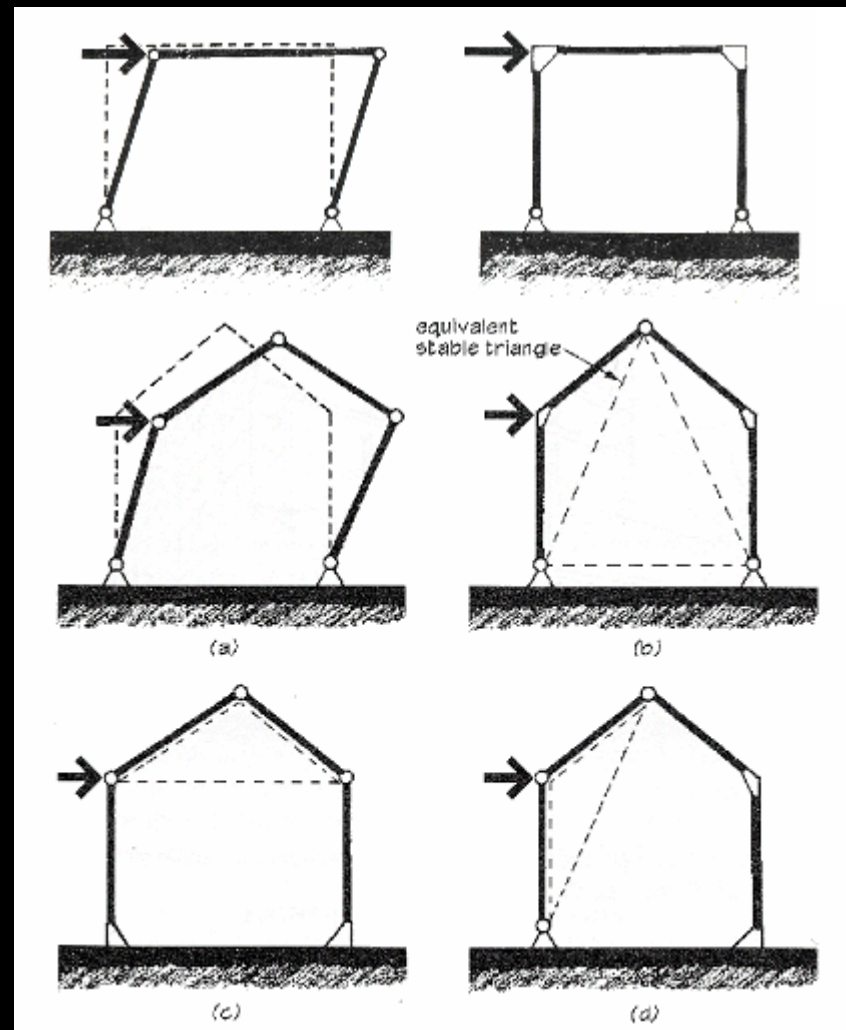
Pinned Frames

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



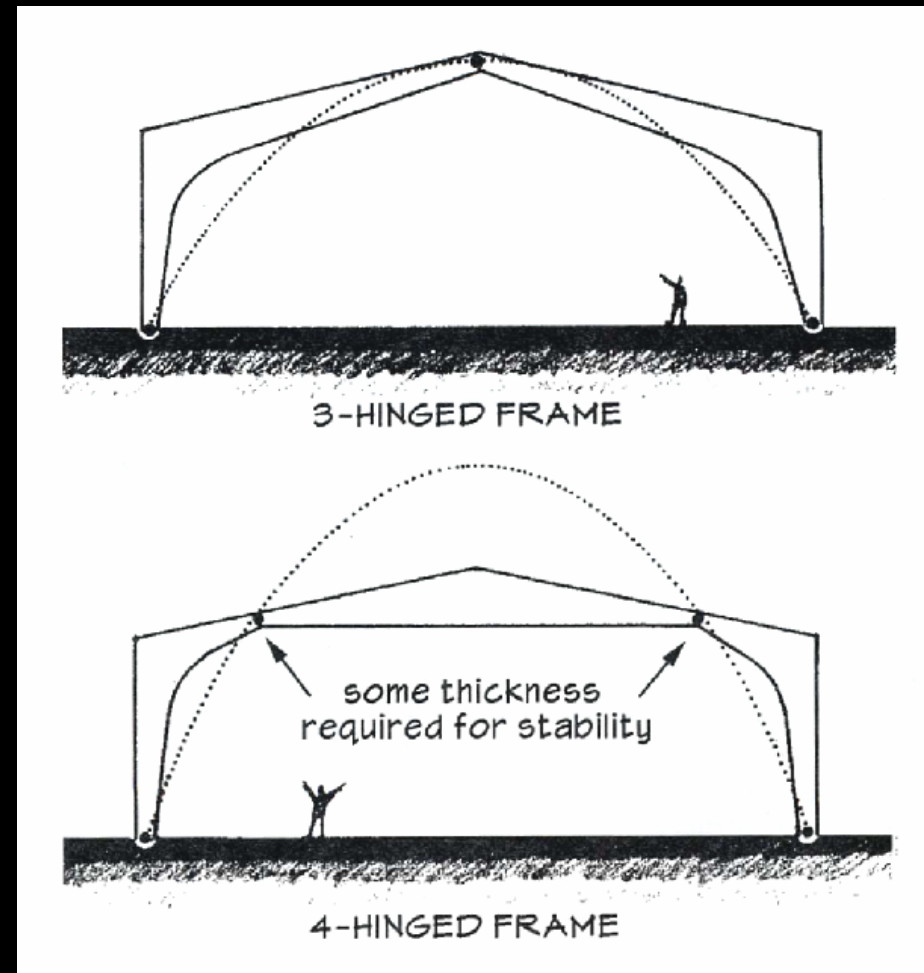
Rigid Frames

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



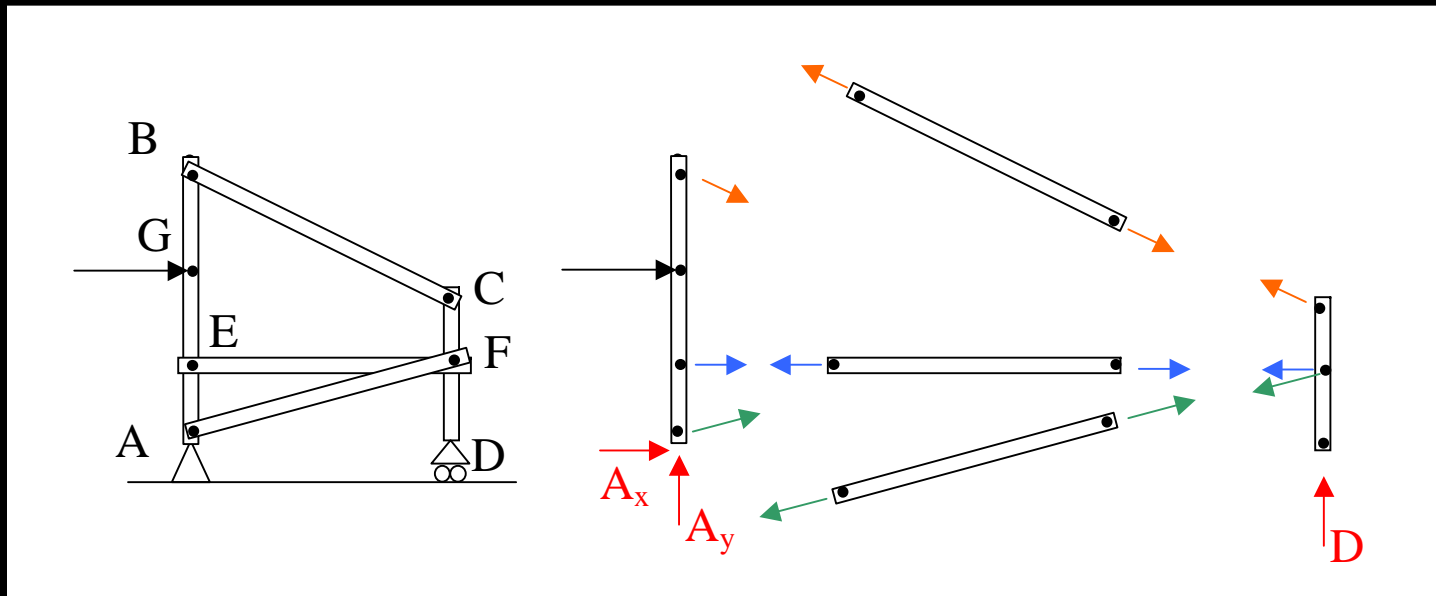
Rigid Frames with PINS

- *frame pieces with connecting pins*
- *not necessarily symmetrical*



Internal Pin Connections

- *statically determinant*
 - 3 equations per body
 - 2 reactions per pin + support forces



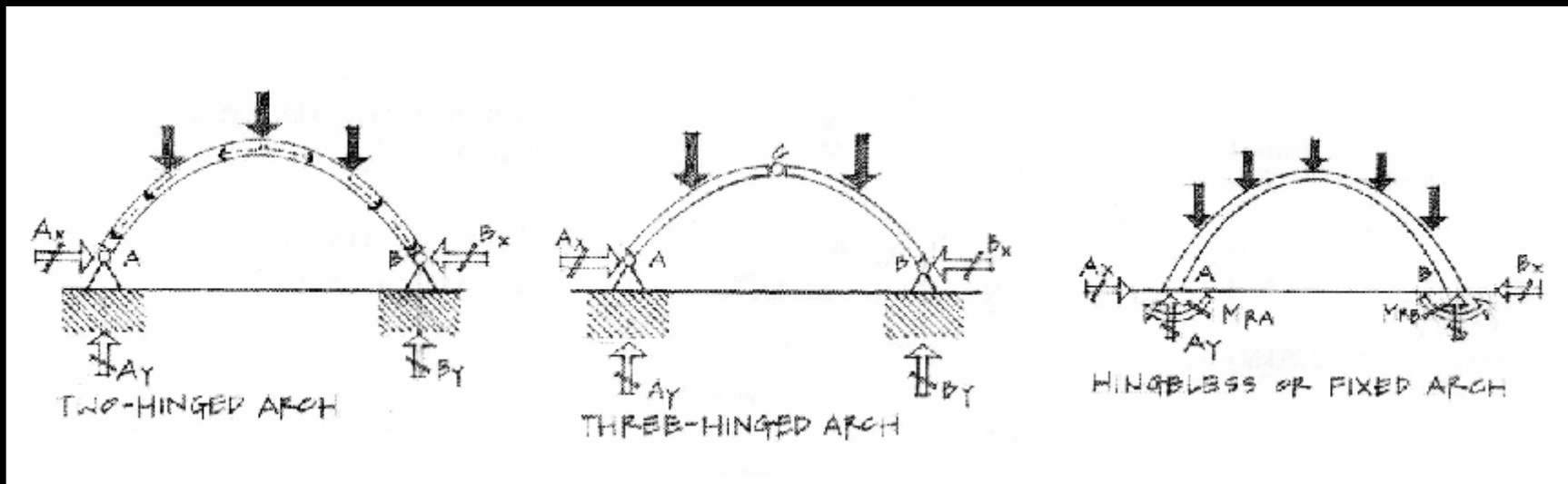
Arches

- *ancient*
- *traditional shape to span long distances*



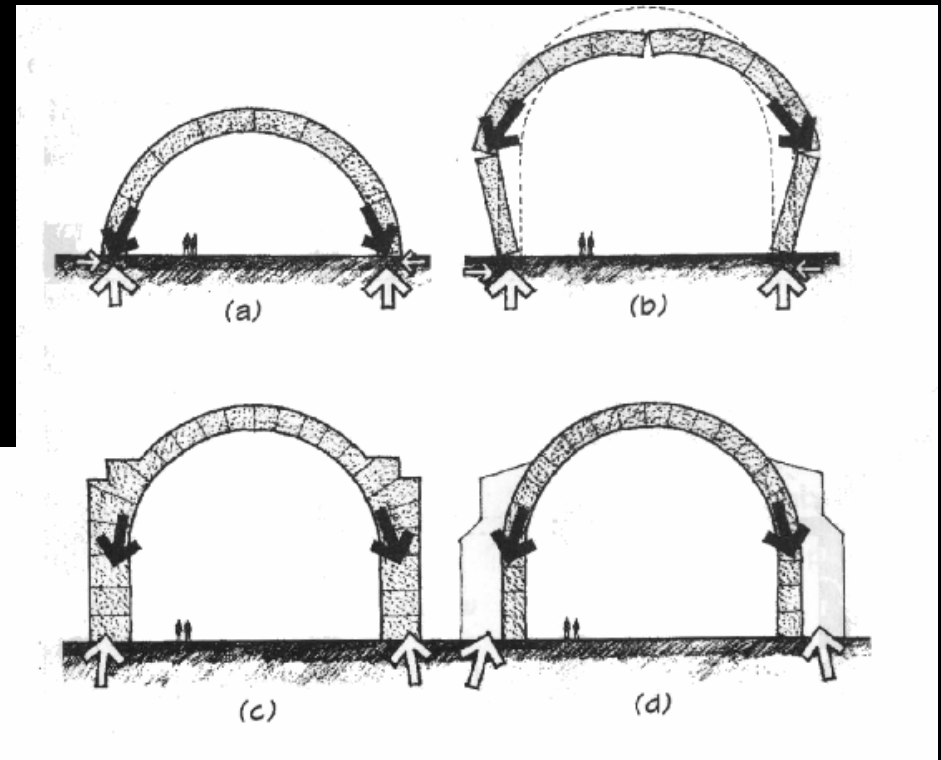
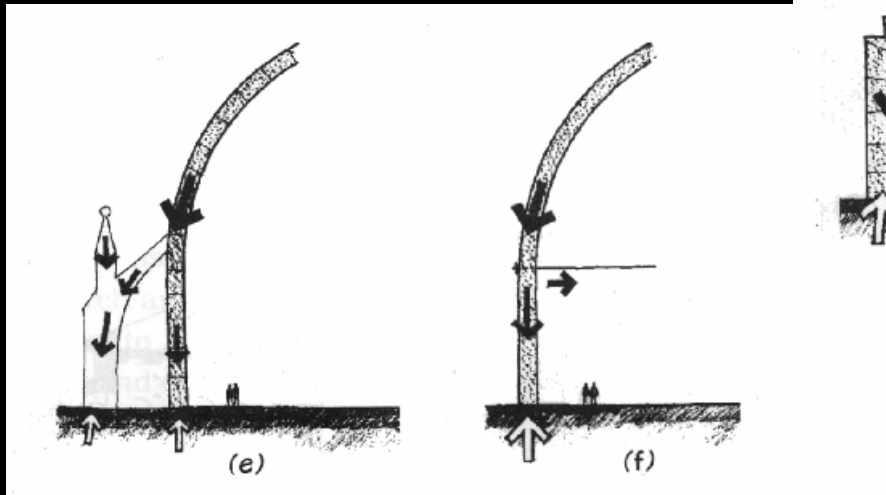
Arches

- *primarily sees compression*
- *a brick “likes an arch”*



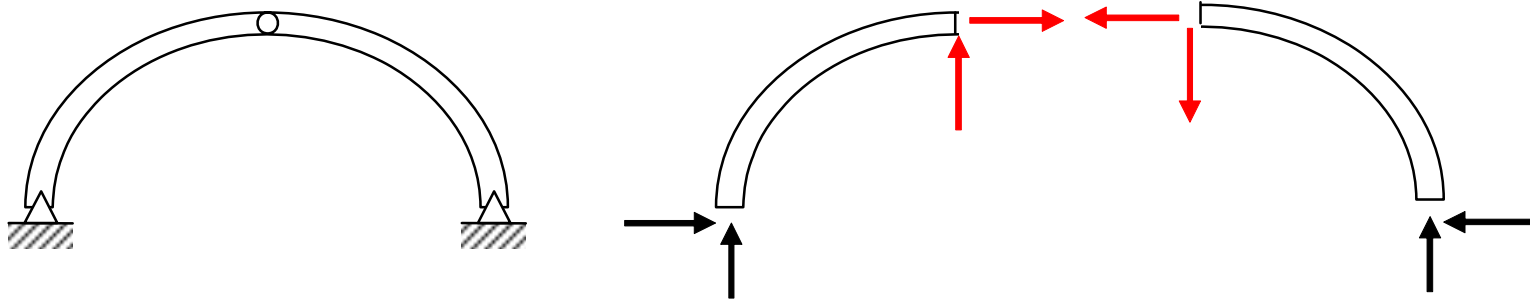
Arches

- *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*