ARCHITECTURAL STRUCTURES I:
STATICS AND STRENGTH OF MATERIALS
ENDS 231
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FALL 2007

lecture
SIX

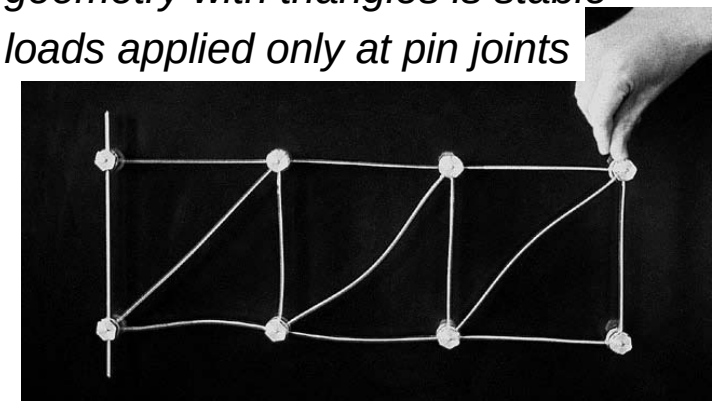
introduction to trusses

Truss Structures

- ancient (?) wood
  - Romans 500 B.C.
- Renaissance revival
- 1800's analysis
- efficient

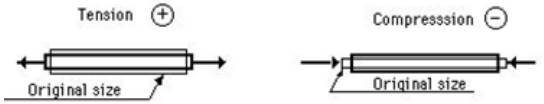
Truss Structures

- comprised of straight members
- geometry with triangles is stable
- loads applied only at pin joints

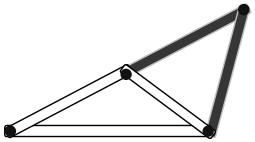


Truss Structures

- 2 force members
  - compression
  - tension



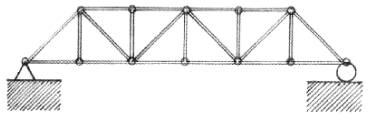
- 3 members connected by 3 joints
- 2 more members need 1 more joint



$$b = 2n - 3$$

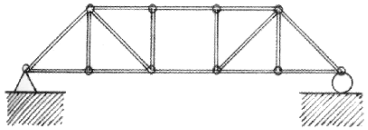
Truss Structures

- *statically determinate*
- *indeterminate*
- *unstable*



b = 21 n = 12 2(n) – 3 = 2(12) – 3 = 21

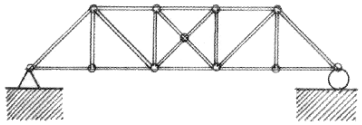
(a) Determinate.



b = 16 n = 10 b = 16 < 2(10) – 3 = 17

(Too few members—square panel is unstable)

(c) Unstable.



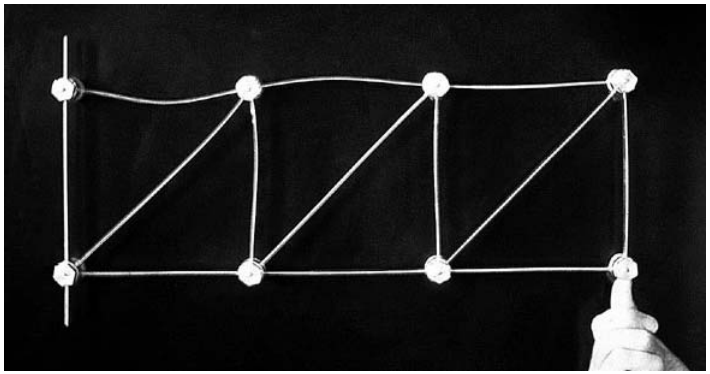
b = 18 n = 10 b = 18 > 2(10) – 3 = 17

(Too many members)

(b) Indeterminate.

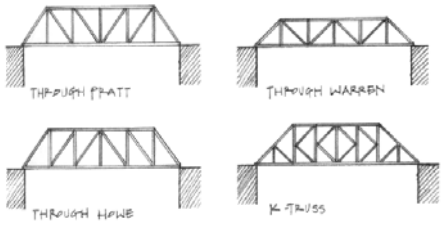
Truss Analysis

- *visualize compression and tension from deformed shape*

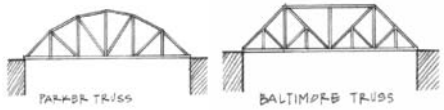


Truss Analysis

- *Method of Joints*
- *Graphical Methods*
- *Method of Sections*

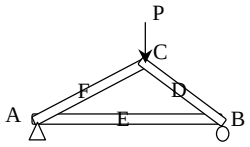


- *all rely on equilibrium*
  - *of bodies*
  - *internal equilibrium*

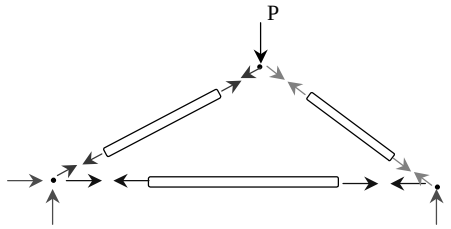


Method of Joints

- *isolate each joint*
- *enforce equilibrium in F_x and F_y*
- *can find all forces*

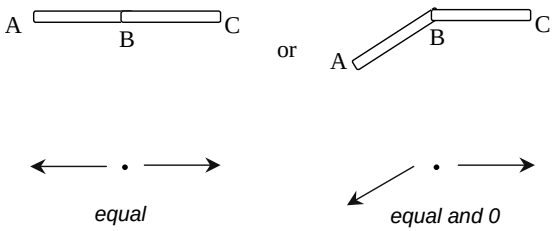


- *long*
- *easy to mess up*



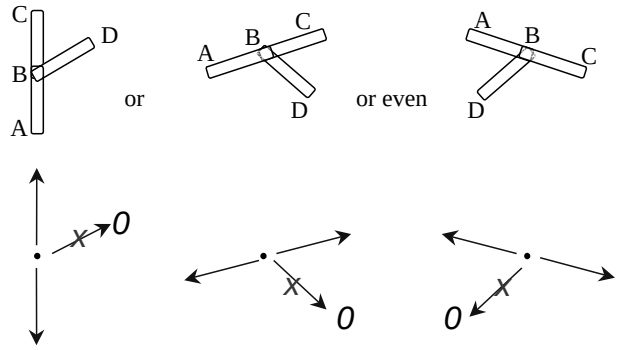
Joint Cases

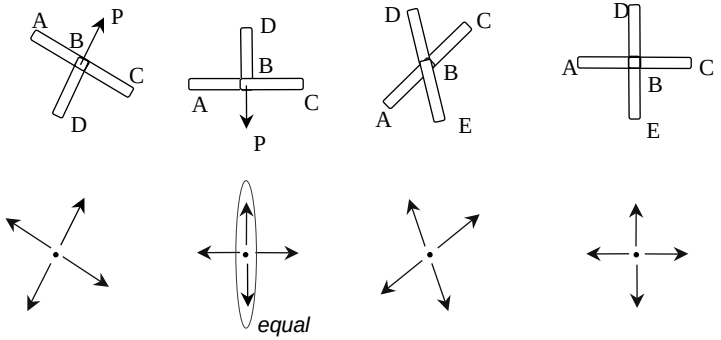
- *two bodies connected*



Joint Cases

- *three bodies with two in line*



Joint Cases

- *crossed*