

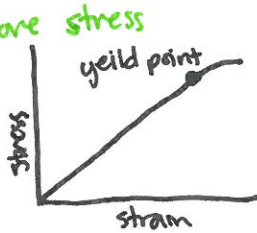
Providing Structural Support

Loads and Stresses

- gravity ↓
- dead load = building
- live load = less constant forces



- compression = squeezing
- tension = stretching
- * more weight = more stress
- yield point - point elastic stops



Vertical Support

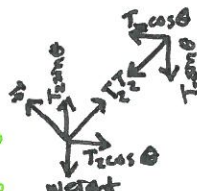


- column = supports portion
- wall = supports edge
- tension = hanging

* too slender = buckles under stress

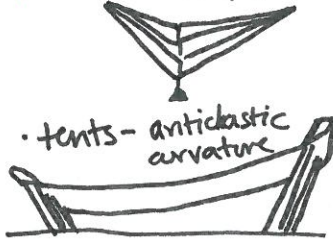
Horizontal Spanning: Tension Devices

- chain pulling on cliffs



* shorter chain + smaller angle = more pull

• Funicular shapes



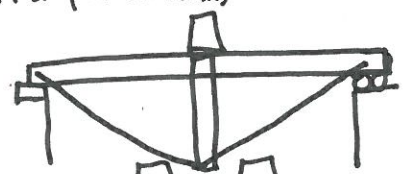
• tents - anticlastic curvature

Thrust-free Spanning Devices: Trusses

- no horizontal push or pull on walls



• simple wood truss



• diagonal chains avoid buckling



* greater depth = lower stress



• use wood instead of chains

• space frame can span as wide as arches + vaults

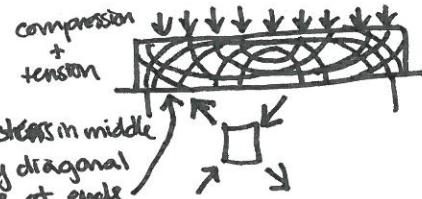
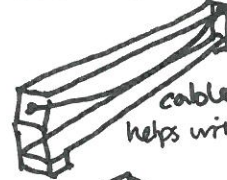
• invert + compression + tension switch



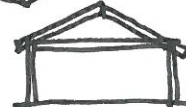
Beams



• concrete = arch + chain
* shallower = depth thickeners + forces grow



• high stress in middle
• heavy diagonal forces at ends



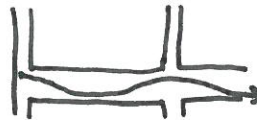
• sloped beams = need tie or need center point



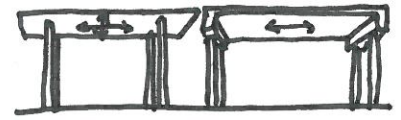
• want to avoid bending

Slabs

• post-tensioned steel in tension



• two way (waffle slab) • one way (ribbed slabs)



Other

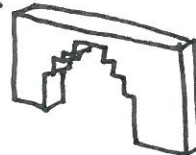
rigid frame

- beam + arch
- very large spans



corbel

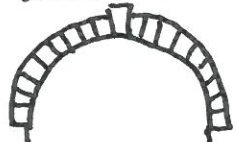
- stone or brick
- small cantilevers



Arches

- stone
- leaning blocks against each other
- each stone has a weight
- compression

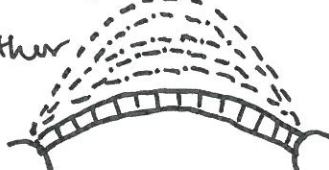
• semicircular



• flat



• parabola



- like chain
- can buckle
- in compression
- not slender

* new materials = span farther + less material