Steel construction: trusses, decks & plate girders
Iron & Steel Trusses

- cast iron
  - 18th century
  - chain links
- wrought-iron
- rivets

http://nisee.berkeley.edu/godden
Truss Connections

- gusset plates
- bolts
- welds

(AISC - Steel Structures of the Everyday)

http://courses.civil.ualberta.ca
Trusses

• require lateral bracing
• consider buckling
• indeterminate trusses
  – extra members
  – solvable with statics
    • cables can’t hold compression
  – displacement methods
    • elastic elongation
  – too few members, unstable
Manufactured Trusses

- open web joists
- parallel chord
Open Web Joists

• **SJL:**  [www.steeljoist.com](http://www.steeljoist.com)

• **Vulcraft:**  [www.vulcraft.com](http://www.vulcraft.com)
  - **K Series (Standard)**
    - 8-30” deep, spans 8-50 ft
  - **LH Series (Long span)**
    - 18-48” deep, spans 25-96 ft
  - **DLH (Deep Long Spans)**
    - 52-72” deep, spans 89-144 ft
  - **SLH (Long spans with high strength steel)**
    - pitched top chord
    - 80-120” deep, spans 111-240 ft
Decks

- sheet steel
- composite
Plate Girders

- welds
- web stiffeners

stiffeners at end where shear is greatest and at support

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Steel Trusses 8 Lecture 17
Elements of Architectural Structures ARCH 614
Web Bearing

- **max loads**

\[
P_{n(max-end)} = (N + 2.5k)F_{yw}t_w
\]

\[
P_{n(max-interior)} = (N + 5k)F_{yw}t_w
\]
Space Trusses

- 3D with 2 force bodies and pins
  - pyramid
  - tetrahedron
- “frames” have fixed joints
- layers
- 40’s
Space Trusses

- connections

- supports

(a) UNISTRUT (System U)  
(b) TRIODETIC  
(c) MERO (KK-ball)

(a) CORNER SUPPORTS  
(b) PERIMETER SUPPORTS

(a) COLUMN (POINT) SUPPORT  
(b) INVERTED PYRAMID

(c) CROSSHEAD BEAMS

PLAN  
(crosshead beam support)
Space Trusses
Space Trusses
Tensegrites

- 3D frame
- discontinuous struts
- continuous cables
Method of Sections

- relies on internal forces being in equilibrium on a section
- cut to expose 3 or less members
- coplanar forces \( \sum M = 0 \) too
Method of Sections

- joints on or off the section are good to sum moments
- quick for few members
- not always obvious where to cut or sum