lecture seventeen

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

Plate web
angle stiffeners
thicker flange in center where moment is greatest

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

stiffeners to prevent lateral buckling
Web Bearing

- max loads

\[ P_{n(max \text{ - end})} = (N + 2.5k)F_ytw \]

\[ P_{n(max \text{ - interior})} = (N + 5k)F_ytw \]
Space Trusses

- 3D with 2 force bodies and pins
  - pyramid
  - tetrahedron

- “frames” have fixed joints
- layers
- 40’s
Space Trusses

- connections
- supports
Space Trusses

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Space Trusses
Tensegrities

- 3D frame
- discontinuous struts
- continuous cables

Free Ride Home – Kenneth Snelson
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