Iron & Steel Trusses

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

Truss Connections

- gusset plates
- bolts
- welds

Trusses

- require lateral bracing
- consider buckling
- indeterminate trusses
  - extra members
    - diagonal tension counters
  - 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

- SJI: www.steeljoist.com
- Vulcraft: 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

Load Tables - \( w \)

<table>
<thead>
<tr>
<th>Joint Designation</th>
<th>10K</th>
<th>13K</th>
<th>12K</th>
<th>15K</th>
<th>16K</th>
<th>18K</th>
<th>20K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. Width (in.)</td>
<td>5.0</td>
<td>5.0</td>
<td>5.7</td>
<td>7.1</td>
<td>5.2</td>
<td>6.6</td>
<td>6.7</td>
</tr>
<tr>
<td>Load for live load deflection limit (L/360) in RED</td>
<td>5.5</td>
<td>6.3</td>
<td>7.0</td>
<td>7.5</td>
<td>8.1</td>
<td>8.6</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Decks

- sheet steel
- composite
Light-gage Steel

- **sheet metal**
  - shaped
  - studs, panels, window frames
  - gage
  - based on weight of 41.82 lb/ft² / inch of thickness
  - 24, 22, 18, 16, i.e.
  - 0.0239, 0.0329, 0.0474, 0.0598 in
  - 0.6, 0.85, 1.0, 1.3, 1.6 mm

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Steel Decks

- **“Texas” style**
  - corrugated
- **common**
  - 1 – 3 spans
  - can be insulated
  - composite
  - with concrete

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Steel Decks

- **common fire proofing**
  - cementitious spray
  - composite concrete

- **non-composite**
  - concrete is fill

- **lateral bracing**
- **diaphragm action**

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Load Tables - w

- **live load**
  - deflection limit L/240

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Notes:
1. Load tables are calculated using sectional properties based on the steel design thickness shown in the Steel Deck Institute (SDI) Design Manual.
2. Loads shown in the shaded areas are governed by the live load deflection limit in excess of 1/240 of the span.
3. A steel load of 100 lb/ft² has been included.

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Load Tables for Type 1.5B

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Steel Trusses 9
Lecture 19
Foundations Structures
ARCH 331
F2008abn

Steel Trusses 10
Lecture 19
Foundations Structures
ARCH 331
F2008abn

Steel Trusses 11
Lecture 19
Foundations Structures
ARCH 331
Su2011abn

Steel Trusses 12
Lecture 19
Foundations Structures
ARCH 331
F2008abn
Plate Girders
- welds
- web stiffeners

Web Bearing
- max loads

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

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

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

Space Trusses
- connections
- supports

(a) HALF OCTAHEDRON (equilateral pyramid)
(b) TETRAHEDRON
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

\[
\begin{align*}
A & \quad B \\
C & \quad P \\
F & \quad E \\
D & \quad \text{coplanar forces} \\
\end{align*}
\]
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