Welded Connection Design

• considerations
  – shear stress
  – yielding
  – rupture

Welded Connection Design

• weld terms
  – butt weld
  – fillet weld
  – plug weld
  – throat
• field welding
• shop welding
Welded Connection Design

- **weld process**
  - melting of material
  - melted filler - electrode
  - shielding gas / flux
  - potential defects

- **weld materials**
  - E60XX
  - E70XX
  \[ F_{EXX} = 70 \text{ ksi} \]

Welded Connection Design

- **shear failure assumed**
- **throat**
  \[ T = 0.707 \times \text{weld size} \]
- **area**
  \[ A = T \times \text{length of weld} \]
- **weld metal generally stronger than base metal** (ex. \( F_y = 50 \text{ ksi} \))

Welded Connection Design

- **minimum**
  - table

- **maximum**
  - material thickness (to ¼”)
  - 1/16” less

- **min. length**
  - 4 x size min.
  - \( \geq 1 \frac{1}{2} ” \)

\[ R_a \leq R_n \]

\[ R_n \leq \phi R_n \]

\[ \phi = 0.75 \]

\[ R_n = 0.6 F_{EXX} T l = S l \]

Welded Connection Design

- table for \( \phi S \)

<table>
<thead>
<tr>
<th>Material Thickness of Thinner Plate Joiners (in.)</th>
<th>Minimum Size of Fillet Welds (in.)</th>
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<tbody>
<tr>
<td>( \frac{3}{16} ) to ( \frac{1}{4} )...</td>
<td>( \frac{1}{8} )...</td>
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</table>

\[ (1) \text{ Limit dimensions of fillet welds. Single pass welds not to be used.} \]

\[ (2) \text{ See Section 5.2.7 for maximum size of fillet welds.} \]
Framed Beam Connections

• welded example (shear)

(AISC - Steel Structures of the Everyday)

Framed Beam Connections

• welded moment example

(AISC - Steel Structures of the Everyday)

Framed Beam Connections

• welded/bolted moment example

(AISC - Steel Structures of the Everyday)
**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

**Steel Decks**

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

**Steel Decks**

- common fire proofing
  - cementicious spray
- composite concrete
- non-composite
  - concrete is fill
- lateral bracing
- diaphragm action

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**Steel Decks**

- load tables

**VERTICAL LOADS FOR TYPE 3N**

<table>
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<th>No. of</th>
<th>Deck</th>
<th>Load Tables</th>
<th>Load Tables</th>
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</table>

Notes:
1. Load tables are calculated using sectional properties based on the steel design thickness shown in the Steel Deck and Lite CDE/DEP Manual.
2. Load tables shown in the shaded area are governed by the live load deflection not in excess of 12/100 of the span.
3. Steel Decks not shown in shaded area are not covered under Factory Mutual.