Materials Selection

Selection of Tool Steel

By
Russell Glass, Jacob Klinginsmith, Rebecca Moffit, Naomi Sanders

Selection of Stainless Steel

Mechanical Properties

<table>
<thead>
<tr>
<th>Material</th>
<th>Composition</th>
<th>Mechanical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 403</td>
<td>18% Cr, 8% Ni</td>
<td>Tensile Strength: 76.5 ksi, Yield Strength: 46.5 ksi, Modulus of Elasticity: 2.9 x 10^6 ksi</td>
</tr>
<tr>
<td>AISI 316L</td>
<td>16% Cr, 10% Ni</td>
<td>Tensile Strength: 74.5 ksi, Yield Strength: 44.0 ksi, Modulus of Elasticity: 2.9 x 10^6 ksi</td>
</tr>
<tr>
<td>AISI 304</td>
<td>18% Cr, 8% Ni</td>
<td>Tensile Strength: 68.0 ksi, Yield Strength: 33.0 ksi, Modulus of Elasticity: 2.9 x 10^6 ksi</td>
</tr>
</tbody>
</table>

Selection of Mild Steel

Mechanical Properties

<table>
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<tr>
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<th>Composition</th>
<th>Mechanical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 1010</td>
<td>0.28% C, 0.7% Mn, 0.6% Si</td>
<td>Tensile Strength: 29.0 ksi, Yield Strength: 17.7 ksi, Modulus of Elasticity: 2.7 x 10^6 ksi</td>
</tr>
<tr>
<td>AISI 1020</td>
<td>0.28% C, 0.7% Mn, 0.6% Si</td>
<td>Tensile Strength: 60.3 ksi, Yield Strength: 30.4 ksi, Modulus of Elasticity: 2.7 x 10^6 ksi</td>
</tr>
<tr>
<td>AISI 1050</td>
<td>0.28% C, 0.7% Mn, 0.6% Si</td>
<td>Tensile Strength: 112.0 ksi, Yield Strength: 63.8 ksi, Modulus of Elasticity: 2.7 x 10^6 ksi</td>
</tr>
</tbody>
</table>

Selection of Aluminum

Mechanical Properties

<table>
<thead>
<tr>
<th>Material</th>
<th>Composition</th>
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</tr>
</thead>
<tbody>
<tr>
<td>6061-T6</td>
<td>6% Al, 0.6% Mg</td>
<td>Tensile Strength: 47.0 ksi, Yield Strength: 27.5 ksi, Modulus of Elasticity: 10.5 x 10^6 ksi</td>
</tr>
<tr>
<td>7075-T6</td>
<td>4.5% Mg, 0.5% Zn</td>
<td>Tensile Strength: 93.0 ksi, Yield Strength: 45.0 ksi, Modulus of Elasticity: 10.5 x 10^6 ksi</td>
</tr>
<tr>
<td>2024-T3</td>
<td>4.5% Mg, 0.5% Zn</td>
<td>Tensile Strength: 67.0 ksi, Yield Strength: 35.0 ksi, Modulus of Elasticity: 10.5 x 10^6 ksi</td>
</tr>
</tbody>
</table>

Selection of High Carbon Steel

Mechanical Properties

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<thead>
<tr>
<th>Material</th>
<th>Composition</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1010</td>
<td>0.17% C, 0.7% Mn, 0.6% Si</td>
<td>Tensile Strength: 112.0 ksi, Yield Strength: 63.8 ksi, Modulus of Elasticity: 2.7 x 10^6 ksi</td>
</tr>
<tr>
<td>1020</td>
<td>0.28% C, 0.7% Mn, 0.6% Si</td>
<td>Tensile Strength: 60.3 ksi, Yield Strength: 30.4 ksi, Modulus of Elasticity: 2.7 x 10^6 ksi</td>
</tr>
<tr>
<td>1050</td>
<td>0.28% C, 0.7% Mn, 0.6% Si</td>
<td>Tensile Strength: 112.0 ksi, Yield Strength: 63.8 ksi, Modulus of Elasticity: 2.7 x 10^6 ksi</td>
</tr>
</tbody>
</table>

Composition:

- **Mn**: 0.5 - 1.2%
- **Si**: 0.2 - 0.3%
- **C**: 0.8 - 1.0%
- **Mg**: 0.04 - 0.08%
- **Zn**: 0.1 - 0.26%
- **Ti**: 0.05 - 0.15%
- **Cu**: 0.15 - 0.30%
- **Cr**: 0.3 - 0.5%
- **Ni**: 0.1 - 0.3%

Information from: matweb.com and efunda.com