Steel Ribs
Introduction

Steel ribs are efficient and safe ground control elements in underground construction. Selection of section type and dimension is accomplished in accordance with structural and project requirements. Besides custom-bent steel ribs, straight beams, forepoling sheets, and steel lagging can also fabricated.

DSI Underground Systems has manufactured cold-formed beams for underground support applications since 1922, applying sound techniques for shaping steel required in the Tunneling industry.

Techniques learned about shaping steel for strength, performance, and value in the world's tunnels and shafts can be applied to the benefit for each project.
Main Advantages

- Customized cold-formed beam constructions
- Various rib support types available on request
- Flexible adaptation of the beam geometry to the respective excavated cross-section
- TH sections and other special support profiles available on request
- Custom formed lagging resistant to machine jack thrusts and impact loads

Steel Rib Support Types

- **Type 1:**
  - 2 pcs. horseshoe with optional invert strut

- **Type 3:**
  - 4 pcs. horseshoe

- **Type 2:**
  - 4 pcs. modified horseshoe

- **Type 4:**
  - 3 pcs. circular

Tunnel Ribs

Shaft Rings and Breakout Structures

Mine Sets and Overcasts

Steel Lagging
Specifications SI Units

TH Profile

- Mine support steel 31Mn4 according to DIN 21544
- Bent to the corresponding profile
- Single overlapping segments are usually connected by two locks
- Alternative TH locks are available on request

<table>
<thead>
<tr>
<th>Characteristic Value / Type</th>
<th>Symbol</th>
<th>Unit</th>
<th>TH 21</th>
<th>TH 25</th>
<th>TH 29</th>
<th>TH 36</th>
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<tbody>
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<td>[mm]</td>
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<td>[mm]</td>
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<td>135</td>
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<td>171</td>
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<td>[mm]</td>
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<td>69</td>
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<tr>
<td>Section modulus</td>
<td>W_x</td>
<td>[cm³]</td>
<td>61</td>
<td>80</td>
<td>94</td>
<td>136</td>
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HEB Profile

- I profile – broad flange girder
- Primary material S235JRG2 or S355J2G3 according to EN 10025-2
- Bent to the corresponding profile
- Connection of the segments via head plates that are available in different designs
- Alternative connection of the abutting segments via laces
- Different lace types and lace screws are available on request

<table>
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<tr>
<th>Characteristic Value / Type</th>
<th>Symbol</th>
<th>Unit</th>
<th>HEB 100</th>
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<th>HEB 140</th>
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<td>[kg/m]</td>
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<td>H</td>
<td>[mm]</td>
<td>100</td>
<td>120</td>
<td>140</td>
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<tr>
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<td>[mm]</td>
<td>100</td>
<td>120</td>
<td>140</td>
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<td>[cm³]</td>
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<td>W_y</td>
<td>[cm³]</td>
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<td>52.9</td>
<td>78.5</td>
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UNP Profile

- U profile – flanges with inclined inner surfaces
- Primary material S235JRG2 or S355J2G3 according to EN 10025-2
- Bent to the corresponding profile
- Connection of the segments via welded-on and screwed head plates or flange connections
- Different lace types and lace screws are available on request

<table>
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<th>Characteristic Value / Type</th>
<th>Symbol</th>
<th>Unit</th>
<th>UNP 80</th>
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<td>[mm]</td>
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<td>100</td>
<td>120</td>
<td>140</td>
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<td>180</td>
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<tr>
<td>Profile width</td>
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<td>50</td>
<td>55</td>
<td>60</td>
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<td>70</td>
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<td>8.5</td>
<td>11.1</td>
<td>14.8</td>
<td>18.3</td>
<td>22.4</td>
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Specifications US Customary Units

- Butt joints
  - Height: rib depth plus 1"
  - Width: flange width plus 1"
- Pipe spacers
  - Schedule 40 pipe stock Ø 2" (for Ø ¾" tie rods)
  - Length: rib spacing minus web thickness
- Tie rods
  - ASTM A529 Ø ¾" rod stock with 4" NC threaded each end
  - Length: rib spacing plus 6"
  - Beam width 12" and above: structural spreaders are recommended

Joints and Foot Plates

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<th>Characteristic Value</th>
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<th>4&quot;</th>
<th>5&quot;</th>
<th>6&quot;</th>
<th>8&quot;</th>
<th>10&quot;</th>
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<td>3/8</td>
<td>1/2</td>
<td>5/8</td>
<td>3/4</td>
<td>1</td>
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<td>Bolt quantity 1)</td>
<td>[1]</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Bolt diameter 1)</td>
<td>[in]</td>
<td>3/4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Foot plate dimensions 1)</td>
<td>[in]</td>
<td>½&quot; x 7&quot; x 7&quot;</td>
<td>5/8&quot; x 9&quot; x 9&quot;</td>
<td>5/8&quot; x 9&quot; x 9&quot;</td>
<td>¾&quot; x 12&quot; x 12&quot;</td>
<td>1&quot; x 14&quot; x 14&quot;</td>
<td>1¼&quot; x 16&quot; x 16&quot;</td>
</tr>
</tbody>
</table>

1) ASTM A325. For standard loading conditions; higher loads may require a full-moment strength joint.
Characteristics

- Curvature range: minimum radius of 10 times the beam depth for 4" and 6" sections up and to 14 times for larger beams
- I, WF, and H sections from 4" to 27" (102 to 686 [mm]) in depth, bent to project requirements

Steel Lagging (North America)

- Custom-formed as a replacement for wood lagging
- Placement on the inside or outside flange
- Low profile and high profile types
- Lagging clamp: 3" x 5" x 5" gage with square or round hole
- 5/8" diameter carriage bolt with nut

![Formed Channel](image)
![High Profile](image)
![Low Profile](image)

![Steel Lagging](image)
Please note:
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