CONTENTS

1 Scope 03
2 Quality assurance 03
3 Steel-making process 04
4 Rolling process 04
5 Chemical composition 04
6 Mechanical testing 04
7 Dimensions and tolerances 04
8 Surface quality 05
9 Marking 05
10 Bundling 05
11 Certification 05
12 Appendices 06

1 Scope

This specification describes the technical requirements for the supply of crane rails by British Steel. They are available in the following sizes with guideline references relating to the sketch below:

Illustration of a Crane Rail Cross Section

<table>
<thead>
<tr>
<th>Property</th>
<th>Mass per metre</th>
<th>Area of cross section</th>
<th>Moment of inertia lx-x</th>
<th>Moment of inertia ly-y</th>
<th>Section Modulus Zx-x</th>
<th>Section Modulus Zy-y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane rail 89 kg/m</td>
<td>89.8</td>
<td>110.5</td>
<td>121.4</td>
<td>191.1</td>
<td>134.5</td>
<td>223.1</td>
</tr>
<tr>
<td>Crane rail 125 kg/m</td>
<td>124.5</td>
<td>159.6</td>
<td>202.3</td>
<td>246.8</td>
<td>302.8</td>
<td>273.1</td>
</tr>
</tbody>
</table>

* Also referred to as MRS87a

We also have scope to produce the American Range rails including CR104, CR105, CR135, CR171 & CR175 and the Special Rails MRS73, MRS86, MRS125, MRS192, MRS221, AS86, CR73, CR100, CRS140, JKL55, SP100 & SP120.

1 Scope

British Steel Special Profiles are fully approved to ISO 9001 and ISO 14001 standards for Quality Management and Environmental Management respectively. The entire manufacturing and inspection process is fully compliant with all British Steel Quality Management Systems, Codes of Practice and Working Procedures. The Quality Management System is independently audited and approved by Lloyds Register of Quality Assurance on an ongoing basis. Although not directly related to crane rails, this product also manufactures significant volumes for marine grade products and as such the quality control systems are heavily audited by numerous external inspectorates.
3 Steel-making process
All steel is made by the basic oxygen process (BOS) and is continuously cast to bloom using a clean steel process. All material is supplied fully silicon-killed.

4 Rolling process
All material is hot rolled and is supplied in the as-rolled metallurgical delivery condition.

5 Chemical composition
Crane rail is currently available in the following analysis ranges in line with DIN 536-1, with the scope and desire to develop new grades as the market requires.

<table>
<thead>
<tr>
<th>Ladle Analysis</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Si</td>
<td>Mn</td>
<td>P</td>
<td>S</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>690</td>
<td>Min</td>
<td>0.40</td>
<td>-</td>
<td>0.80</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max</td>
<td>0.60</td>
<td>0.35</td>
<td>1.25</td>
<td>0.045</td>
<td>0.045</td>
<td>-</td>
</tr>
<tr>
<td>880</td>
<td>Min</td>
<td>0.60</td>
<td>-</td>
<td>0.80</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max</td>
<td>0.80</td>
<td>0.50</td>
<td>1.35</td>
<td>0.045</td>
<td>0.045</td>
<td>-</td>
</tr>
<tr>
<td>90V</td>
<td>Min</td>
<td>0.50</td>
<td>-</td>
<td>0.80</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max</td>
<td>0.70</td>
<td>0.50</td>
<td>1.40</td>
<td>0.030</td>
<td>0.030</td>
<td>0.20</td>
</tr>
</tbody>
</table>

6 Mechanical testing
Tensile properties are determined in accordance with EN10002-1, using turned longitudinal tensile specimens taken from the head of the rail at a frequency of 1 / 30 t rolled. The minimum strength requirements are as follows:

<table>
<thead>
<tr>
<th>Mechanical Properties</th>
<th>Minimum Yield (MPa)</th>
<th>Minimum UTS (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>690</td>
<td>315</td>
<td>690</td>
</tr>
<tr>
<td>880</td>
<td>440</td>
<td>880</td>
</tr>
<tr>
<td>90V</td>
<td>540</td>
<td>880</td>
</tr>
</tbody>
</table>

7 Dimensions and tolerances
Rails are supplied as standard at 12m lengths, and in 11.8m or 11.95m for containers. Other non-standard lengths are available upon request.

- Cutting tolerance ± 100 mm.
- Straightness tolerance 1.5 mm/m maximum, in both the horizontal and vertical directions.
- All saw rags and burrs will be removed.
- End squarness will be 1 mm in any direction.
- Twist 0.5°/m max.
- The central point of the head on Crane Rail 87, when taken as a full cross section, shall not vary by more than 2.5mm in either direction.

8 Surface quality
Imperfections in the surface are considered acceptable at 0.35 mm deep for the rail running surface, and 1 mm deep for the rest of the rail. There shall be no more than three acceptable imperfections per 12m rail length. Dressing of surface imperfections:

- Imperfections exceeding the limits above shall be dressed out. Any protrusions affecting the fit of the fishplate shall be dressed to shape. If the imperfection depth cannot be measured it shall be investigated by depth proving, and subsequently dressed to the criteria below, using a rotary burr, lamellar flap tool or grinding belt, providing the work is contour-blended.

9 Marking
Crane rails are hard stamped with individual bar numbers on the foot of the rail and one label per bundle. Additional marking is available upon agreement. All crane rails are branded with SK - UK.

10 Bundling
Bundles are built with signode-type metal banding as required. All bundles are built up with the same advised cut length. Maximum bundle weight and bundle configuration can be set by agreement.

11 Certification
All Inspection Certificates will be issued in full accordance with EN10204 Type 3.1 requirements. This will include:

- Purchase Order Number.
- Cast Number.
- Ladle analysis details as specified in Section 5 above.
- Mechanical properties.
- Ultimate tensile strength is quoted as standard.
- Yield strength is supplied for 90V chemistries, or if requested at point of order.
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