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Technical specification for the supply of rails

Spécification technique pour la fourniture de rails

Technische Lieferbedingungen für Schienen



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Leaflet to be classified in Volumes:

VII - Way and Works

VIII - Technical Specifications

Application:

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Record of updates

1re edition, January 1954	This document, first published in 1954 as UIC Leaflet 722, was re-numbered 860 in 1955 and again 860-1 in 1961. When Leaflets 860-1 and 860-2 were merged on 1 January 1963, the resulting Leaflet was once again given the number 860.
6e edition, January 1970	and 1 Amendment
7e edition, January 1979	and 1 Amendment
8e edition, July 1986	and 1 Amendment
9e edition, January 2008	The Leaflet has now been overhauled to reflect recent developments in technology and the publication of European standard EN 13674-1.

The person responsible for this leaflet is named in the UIC Code

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Summary

This Leaflet defines the provisions relating to the quality and the manufacture of the steel used, as well as the acceptance conditions in respect of flat-bottomed rails weighing more than 35 kg per metre made of continuously cast non heat-treated steel.

The chief modifications relating to technological aspects are as follows:

- Deletion of the ingot casting process,
- Checking of the body of the rail,
- Modification of the acceptance gauge approval procedure,
- Revision of point 1.4 on the execution quality,
- Deletion of the specific tests or requirements in respect of the ingot casting process.

When the invitation to tender is made this Leaflet shall be accompanied by the documents necessary for the execution of the order, particularly those relating to the application of the following clauses of this specification:

- 1.1 Manufacturing procedure
- 1.2 Gauges
- 1.3 Marking
- 1.4 Quality of execution
- 1.5 Finishing
- 1.6 Tolerances,
 - 1.6.6 Weight
- 2.3 Nature of tests
 - 2.5.1 Chemical analysis - Nature of tests
- 2.7 Tensile test
- 3.1 Guarantee

At the client's request certain provisions of this Leaflet may be supplemented or replaced by provisions from *EN 13674-1* or other specific technical requirements.

N.B.:

- Where the profile or profiles indicated in the invitation to tender are selected from *EN 13674-1*, some characteristics and particularly the weight per metre may differ from those of the corresponding profiles of UIC Leaflets or national specifications. This is on account of the precise geometrical definition of the profiles contained in *EN 13674-1*.
- Where a heat-treated grade of steel is called for in the invitation to tender, reference may be made to *EN 13674-1*.

1 - Manufacturing conditions

1.1 - Production processes

At the client's request the manufacturer shall specify in his tender the nature and the chief characteristics of his production processes; these may not then be modified without the client being previously informed.

Throughout the whole production process the manufacturer shall apply the rules of the art in order to ensure that the rails satisfy the conditions of this specification. The manufacturer shall take care to produce rails exhibiting the best possible properties, especially in respect of:

- residual stresses,
- content of non-metallic inclusions,
- fracture toughness.

The manufacturer shall, upon request, inform the client of the means adopted to achieve these objectives and of the actual values obtained.

The cross section of the bloom must be such that the forging head obtained is at least 8.

Measures shall be taken to avoid the presence of hydrogen flakes. The manufacturer shall, on request, inform the client of the procedures adopted to avoid the occurrence of such flakes in the rails.

By agreement between manufacturer and purchasing railway a maximum hydrogen content may be set for each particular grade of steel.

1.2 - Gauges

The master rail profile and all the gauges required for the specific checks shall be provided by the manufacturer at his own expense, and shall be submitted for the approval of the client.

Before manufacture, the supplier shall, at the request of the client, produce two sets of male and female gauges conforming to the theoretical outline of the rail section to be produced, together with two sets of plus and minus limit gauges in accordance with the stipulated dimensional tolerances. These gauges shall be stamped for approval by the delegated client. A set of all gauges shall remain in the possession of the client throughout the acceptance period.

Only gauges bearing the stamp of the client shall be valid for checking purposes.

When a master profile or a theoretical gauge has been approved by a client or by an outside inspection agency, it shall also be used for other customers wherever possible.

The asymmetry gauge is shown in Appendix [A - page 20](#).

1.3 - Marking

The marks applied to rails shall be as follows:

1.3.1 - Compulsory marking

1. *In relief*, and very legible, in characters 20 to 30 mm high as desired by the producer, and with a relief height of at least 0,8 mm, on one of the sides of the web
 - the identification mark of the production shop,
 - the last two figures of the year of manufacture,
 - the symbol denoting the grade of steel, in accordance with Appendix B - page 21,
 - the symbol of the rail section or the weight of the rail in kg/m.

Appendix B indicates the order in which these marks are to be shown.

2. *Hot stamped*, at a distance defined in agreement between manufacturer and client.

Of a height at the discretion of the manufacturer, but of at least 10 mm, on one side of the web, where they shall appear at least once, in a position to be agreed between manufacturer and client (or his representative) and using a numerical, alphabetical or alpha-numerical code providing the following indications:

- the number of the cast from which the rail has been rolled,
- the position of the rail in relation to the top of the bloom ,
- all other reference positions of the rail in the cast, as agreed between manufacturer and client.

NB : In the event of hot stamped identification marks disappearing as a result of cropping, they shall be re-identified in agreement with the client or his delegated representative.

1.3.2 - Optional marking

In the invitation to tender the client may specify one or more of the following marks:

In relief:

- the number of the month of manufacture in Roman numerals;
- the symbol denoting the manufacturing process, in accordance with Appendix B;
- a symbol designating rails made by continuous casting.

1.3.3 - Remarks

In a continuous casting sequence a cast shall be considered as including all blooms up to, but excluding, the first bloom emanating entirely from the following cast.

By agreement between manufacturer and client certain marks may be replaced by hot-stamped marks or may be omitted.

By agreement between manufacturer and client both the relief marks and the hot-stamped marks according to standard *EN 13674-1* (see Bibliography - page 28) may be replaced by those specified in this Leaflet.

The relief markings on rails manufactured in accordance with a UIC profile leaflet must include the symbol denoting the rail profile or the weight of the rail in kg/m as specified in each of the UIC Leaflets relating to standardised rail profiles. These are the UIC 60, the UIC 54 and the UIC 50 profiles (*UIC Leaflets 861-1, 861-2 and 861-3*, see Bibliography - page 28).

1.4 - Quality of execution

The rails must be free from all detrimental defects, i.e. faults which might have an unfavourable effect on their behaviour in service.

The manufacturer must draw up a frame of reference in respect of defects specifying the rejection criteria to be adopted for each defect. This frame of reference must be approved by the client prior to the commencement of manufacture.

The manufacturer shall be responsible for ultrasonically inspecting all the rails.

Before production is started the inspection procedure must be approved by the client.

In addition, the inspection may be used for a selective sampling of the rails, in agreement with the client.

Surface defects may be examined by the client, who will decide whether such defects are likely to have an adverse effect on the performance of the rail in service or whether they can be eliminated by appropriate treatment.

1.5 - Finishing

Cold-straightening shall be effected by gradual pressure and without impacts. Where straightening rollers are used the rails must only be passed through once in each straightening plane, unless specially agreed otherwise with the client, and the markings must be protected from the action of the rollers.

The rails shall be cut to length while cold, by milling or by sawing, and the burrs shall be removed without causing any perceptible bevelling of the section.

The holes shall be produced by drilling, and the walls must be perfectly cylindrical and smooth, without any burrs and with slightly chamfered edges.

The method of packing for despatch shall be defined by agreement between manufacturer and client.

1.6 - Tolerances

1.6.1 - Section and ends

	Dimensions in mm	Tolerances	Observations
1 - Height H of rail	$H < 165$ $165 \leq H < 180$	$+ 0,5 \quad - 0,5$ $+ 0,6 \quad - 0,6$	A displacement of - 0,5 mm of the tolerance range is acceptable in the working range of the straightening rollers
2 - Width L of rail foot	$L < 150$ $150 \leq L < 160$	$+ 1,0 \quad - 1,0$ $+ 1,0 \quad - 1,1$	- ditto (with + 0,5 mm)
3 - Nominal width C of the rail head ^a		$\pm 0,5$	- ditto (with + 0,1 mm)
4 - Asymmetry of section ^b	$L < 150$ $150 \leq L < 160$	$+ 1,2 \quad - 1,2$ $+ 1,5 \quad - 1,5$	^c
5 - Thickness of web ^d		$+ 1,0 \quad - 0,5$	
6 - Inclination of fishing surfaces (on the basis of 14 mm parallel to the inclined theoretical fishing surface)		$+ 0,5 \quad - 0,5$	
7- Height of fishplating		Same tolerance as H	
8 - Squareness of the ends		$+ 0,6 \quad - 0,6$	
9 - Other dimensions	as for H	Same tolerance as H	

a. Measured 14 mm below the rail running surface, i.e. at the transition between the gauge corner and the sides of the rail head.

b. Checked using the UIC gauge.

c. Should a client specifically request it, this tolerance may be reduced to $\pm 1,2$ mm for rails of normal grade steel.

d. Measured at the point of minimum thickness.

1.6.2 - Length of rails

(measured at a temperature of 15 °C; in the case of measurements taken at a different temperature allowance should be made for expansion of the rails).

Length	Rails with fish bolt holes at both ends	Other rails
$L \leq 24$ m	± 3 mm	± 6 mm
$24 \text{ m} < L \leq 36$ m	± 4 mm	± 10 mm
$36 \text{ m} < L \leq 60$ m	-	± 20 mm

1.6.3 - Diameter of holes

- For holes ≤ 30 mm: $\pm 0,5$ mm
- For holes > 30 mm: $\pm 0,7$ mm.

1.6.4 - Vertical and horizontal positioning of the holes

The horizontal position of the holes shall be checked using a gauge with a stop designed to come into contact with the end of the rail and with pins designed to enter the holes.

The diameter of the pins shall be smaller than the diameter of the holes by:

- 1 mm for holes ≤ 30 mm
- 1,4 mm for holes > 30 mm

The distances between the centre-lines of the pins and the stop shall be equal to the nominal distances from the centre-line of the holes to the end of the rail.

It must be possible for all the gauge pins to enter the hole at the same time, while the stop is in contact with the end of the rail.

The vertical centring of the holes shall be verified on the basis of the reference plane shown in the drawing in *ISO 5003, Appendix H* (see *Bibliography - page 28*). The drilling side, right or left, is determined by proceeding from the side with the relief markings.

1.6.5 - Straightness

1.6.5.1 - Rail ends

The straightness of the ends shall be checked using a 1,5 m straight-edge (see Fig. 1 - page 8).

- In the vertical plane
This tolerance applies only if the curvature causes the rail end to lift; the maximum permissible deflection is then 0,70 mm.
- In the horizontal plane
The maximum permissible deflection is 0,70 mm.

In the horizontal and vertical planes the maximum deflection must be as far as possible away from the end, and certainly not within 500 mm of the end.

1.6.5.2 - In the body of the rail

- In the vertical plane
The body of the rail shall exhibit no straightness defects greater than 0,40 mm over a base length of 1 500 mm.
- In the horizontal plane
The body of the rail shall exhibit no straightness defects greater than 0,70 mm over a base length of 1 500 mm. The measuring method shall be subject to the approval of the client. In the event of dispute the straightness of the suspect rail(s) shall be checked using a 1 500 mm straight-edge.