Vervangt NEN-EN 13674-1:1999 Ontw.

Nederlandse norm

NEN-EN 13674-1 (en)

Railway applications - Track - Rail - Part 1:
Vignole railway rails 46 kg/m and above

ICS 45.080
oktober 2003

Als Nederlandse norm is aanvaard:
- EN 13674-1:2003,IDT

Normcommissie 345 051 "Spoorwegen"

NEN

©2002 Nederlands Normalisatie-instituut
Postbus 5059, 2600 GB Delft
Telefoon (015) 2 690 390, Fax (015) 2 690 190

Nederlands voorwoord

Voor de in deze norm vermelde normatieve verwijzingen bestaan in Nederland de volgende equivalenten:

vermelde norm	Nederlandse norm	titel
EN 10002-1	NEN-EN 10002-1	Metalen - Trekproef - Deel 1: Beproevingsmethode bij omgevingstemperatuur (en)
EN 10163-1	NEN-EN 10163-1	Leveringsvoorwaarden voor de oppervlaktegesteldheid van warmgewalste platen, plaatstroken en profielen van staal - Deel 1: Algemene eisen (en,nl)
EN 10276-1	NEN-EN 10276-1	Chemische analyse van ijzer en staal - Bepaling van het gehalte aan zuurstof in ijzer en staal - Deel 1: Monsterneming en monstervoorbereidng voor staalmonsters voor de zuurstofbepaling (en)
EN ISO 6506-1	NEN-EN-ISO 6506-1	Metalen - Hardheidsmeting volgens Brinell - Deel 1: Beproevingsmethode (en)
ISO 1099:1975	-	-
ISO 4968:1979	-	-

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13674-1

September 2003

ICS 45.080

English version

Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above

Applications ferroviaires - Voie - Rails - Partie 1: Rails vignole de masse supérieure ou égale à 46 kg/m

Bahnanwendungen - Oberbau - Schienen - Teil 1: Vignolschienen ab 46 kg/m

This European Standard was approved by CEN on 28 February 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13674-1:2003 E

Contents

Foreword

This document (EN 13674-1:2003) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2004, and conflicting national standards shall be withdrawn at the latest by March 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This part of EN 13674 is the first of a series of standards for rails.

Railway applications – Track:

— *Part 1: Vignole railway rails 46 kg/m and above*

— *Part 2: Switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above*

— *Part 3: Check rails*

— *Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m*

Other standards planned for publication include the following:

— Special purpose rail – Part 1:Grooved and associated construction.

— Flash butt welding of new rails R220 and R260 grade rails in a fixed plant.

— Flash butt welding of new R260Mn and R350HT grade rails in a fixed plant.

— Flash butt welding of new R220 and R260 grade rails by mobile welding machines at sites other than at a fixed plant.

— Flash butt welding of R220 and R260 grade reusable rails.

— Flash butt welding in association with crossing construction.

— Approval of aluminothermic welding processes.

— Tests for qualification of aluminothermic welders, approval of contractors and acceptance of welds.

— Restoration of rails by electric arc welding.

Annexes A, B, C, D and E are normative. Annex F is informative.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This Introduction provides an explanation of the concepts, and reasoning used in the production of this standard. Its inclusion also ensures that during future revisions restrictions are removed as technology progresses and to hold them where it has not, thus ensuring continued safety as new producers, products and technologies are introduced.

The most commonly used standards of the world for the supply of railway rails have been reviewed during the preparation of this standard. However, modern rail production technology and the requirements of high speed railways within the Community have demanded a completely new look at the philosophy and content of this part of EN 13674.

Whenever possible this part of EN 13674 is performance based, recognises the European Quality System standard EN ISO 9001 and requires manufacturers to offer the latest proven technology to consistently satisfy the demanding quality of the required product.

This part of EN 13674 has two major divisions:

1) qualifying tests;

2) acceptance tests.

The qualifying tests introduce a number of performance requirements not previously seen in national or international standards. They also include typical results from relevant acceptance tests.

Rail grading is based on hardness rather than tensile strength.

The acceptance tests have been designed to control those characteristics of the rail steel and rail that are of relevance to the production of high quality rails and the demands of the railway.

The steel grades covered by this part of EN 13674 reflect trends in railway usage and heat treated rails are included. The standard includes rail profiles for Vignole rails having a linear mass 46 kg/m and above.

To ensure the supply of high quality rails, some restrictions on production processes have been imposed.

The standard supersedes other standards covered by the scope and applies to all procurements falling inside the requirements of the European Procurement Directive (93/38/EEC of 14th June 1993). In addition CEN required, where possible, a performance based standard, taking into account safety implications and at the same time addressing modern production technology and the requirements of high-speed railways. As a result of the Directive it was recognised that there would be few opportunities (and these would have to be for transparent safety considerations) for derogation from the standard to operate between the user and the manufacturer.

The standard reflects this change in philosophy from the traditional content of rail standards. A review was undertaken of the most commonly used rail standards of the world. All relevant aspects important to both user and manufacturer were considered with the aim of ensuring that all of the content had specific usefulness and relevance. For example rail grading and much of the standard has been based on hardness rather than tensile strength. Whilst the two are directly related, hardness is very quick and cheap to carry out and provides more relevant guidance to the user particularly where properties vary in different parts of the profile.

Since many rail manufacturers would have not previously carried out proving trials, the standard includes a prerequisite for all manufacturers to prove conformity against a set of qualifying test criteria at the time of tendering. The Qualifying tests include all “normal” acceptance test results plus new "type-casting" features such as fracture toughness, fatigue and residual stress. To provide users with the necessary confidence, acceptance limits have been based on results from rail known to have performed well in demanding track installations.

One aspect of the standard which is a complete break from tradition is the inclusion of quality assurance and inspection clause as part of product integrity.

In order that quality management systems are consistent across all manufacturers and that users have the best assurance for the consistency of required product quality on this safety critical component of the track, this rail standard recommends that the manufacturers' quality assurance systems are at least equivalent to the requirements of EN ISO 9001. The inclusion of this requirement also reduces the need to incorporate detailed method and calibration descriptions on items such as normal chemical composition determination and the need to define more extensive testing.

Ideally, manufacturing techniques should not be referenced in a product standard. However, some rail attributes are either not known in an exact manner or are not measurable with satisfactory statistical significance. In such cases best practice manufacturing techniques have been included as a last resort. The equipment specified is that which gives the best probability of achieving the required product for use in track. In the future new technology can add to, but preferably will reduce or delete such items.

Examples of areas where the technological state of the art renders the standard less than complete include:

— oxide/oxygen relationships;

— hydrogen test techniques;

— roller straightening effects on residual stresses;

— roller straightening effects on contact scrub;

— measurement and effect of residual stresses throughout the rail.

1 Scope

This European Standard specifies Vignole railway rails of 46 kg/m and greater linear mass, for general and high speed railway track usage.

Seven pearlitic steel grades are specified covering a hardness range of 200 to 390 HBW and include non heat treated carbon manganese steels; non heat treated alloy steels; and heat treated carbon manganese and low alloy steels.

There are 21 rail profiles specified in this Standard.

Two classes of rail straightness are specified, differing in requirements for straightness, surface flatness and crown profile. Two classes of profile tolerances are specified.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature.*

EN 10163-1, *Delivery requirements for surface condition of hot rolled steel plates, wide flats and sections - Part 1: General requirements.*

EN 10276-1, *Chemical analysis of ferrous materials - Determination of oxygen in steel and iron – Part 1: Sampling and preparation of steel samples for oxygen determination.*

EN ISO 6506-1, *Metallic materials – Brinell hardness test – Part 1: Test method (ISO 6506-1:1999).*

ISO 1099:1975, *Metals - Axial load fatigue testing.*

ISO 4968:1979, *Steel - Macrographic examination by sulfur print (Baumann method).*

BS 6835-1:1988, *Method for determination of the rate of fatigue crack growth in metallic materials - Fatigue crack growth rates of above 10^{-8} m per cycle.*

DIN 50602:1985, *Microscopic examination of special steels using standard diagrams to assess the content of non-metallic inclusions*.

ASTM E399:1991, *Standard test method for plane strain fracture toughness of metallic materials.*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
heat
one liquid steel melt tapped out of a converter or electric arc furnace which includes after continuous casting a given number of blooms relating to the weight of the heat and the extension of the mixing zone. In the case of sequence casting the blooms belonging to the mixing zone should be clearly defined.

3.2
sequence
any number of heats, of the same steel grade, which undergo continuous casting in tundishes. Tundishes can be used in parallel if the caster has many strands.

3.3
heat treated rail
rail that has undergone accelerated cooling from austenitizing temperature during the metallurgical transformation period

3.4
re-heated rail
all rolled rail that has undergone re-austenitization for heat treatment purposes

3.5
mill heat treated rail
heat treated rail that has not undergone re-austenitization after rolling

3.6
rolling process
process between the blooms leaving the heating furnace and exiting the finishing pass

3.7
isothermal treatment process
process whereby blooms are held for a period of time at an elevated temperature for diminishing the hydrogen content

NOTE 1 For maximum efficiency this is as near to (but below) the pearlite to austenite transformation temperature as is practically possible.

NOTE 2 This process is sometimes referred to as sub critical diffusion annealing.

3.8
qualifying tests
special tests and criteria which are relevant to some aspects of the service performance of rails. Acceptance tests also form part of the qualifying tests.

3.9
acceptance tests
tests carried out as part of the process and product control system, normally on a heat, sequence or tonnage basis

4 Information to be supplied by the purchaser

The purchaser shall provide the supplier with the following information at the time of tender or order:

a) the rail profile (see annex A);

b) the steel grade (see clause 5);

c) the profiles class, ‘X’ or ‘Y’ (see 9.2.1);

d) the straightness class ‘A’ or ‘B’ of rail as specified in 9.2.2;

e) the lengths of rail (see 9.2.3 and Table 10);

f) undrilled or drilled rail ends to take fish bolts, and location and dimensions of holes when required (see 9.2.3);

g) any special treatments to be applied to bolt holes;

h) tolerances for bolt holes to which special processes are to be applied;

i) paint code requirements (see 7.4.4).

5 Steel grades

The seven steel grades are given in Table 1. The five hardness ranges of the steel grades shall conform to those given in Table 1.

The steel grade designations referred to in this standard are compared to those in EN 10027-1 and EN 10027-2 in informative annex F.

Table 1 — Steel grades

Grade [a]	Hardness range (HBW)	Description	Branding lines
R200	200 to 240	Carbon – manganese (C-Mn) Non heat treated	No branding lines
R220	220 to 260	Carbon – manganese (C-Mn) Non heat treated	_____
R260	260 to 300	Carbon – manganese (C-Mn) Non heat treated	___ _____
R260Mn	260 to 300	Carbon – manganese (C-Mn) Non heat treated	_____ _____
R320Cr	320 to 360	Alloy (1 %Cr) Non heat treated	_____ _____ _____
R350HT	350 to 390 [b]	Carbon – manganese (C-Mn) Heat treated	____ _____ _____
R350LHT	350 to 390 [b]	Low alloy, heat treated	____ _____ _____ ____

[a] See Table 5 for chemical composition/mechanical properties.

[b] See Table 7 for hardness requirements.

6 Profile drawings/properties/mass

Rail profiles, dimensions, properties and linear masses are given in annex A. The tolerances of certain dimensions shall be as given in Table 8. All other quantities are informative only.

NOTE Linear masses have been calculated based on the density of steel of 7850 kg/m^3.

7 Manufacture

7.1 Product integrity

7.1.1 Factory production control

All Vignole rails shall be produced under a comprehensive system of factory production control which shall ensure confidence in the conformity of the finished product. The system shall address this European Standard to ensure that the finished products consistently comply with requirements to achieve the product integrity necessary to provide assurance of product safety in track.

Manufacturers shall demonstrate continuing compliance, including documented evidence, with the factory production control system required.

Manufacturers having a factory production control system which complies with EN ISO 9001 are recognised as satisfying the minimum requirements specified by this clause.

7.1.2 Best practice manufacture

The product shall be manufactured to the best practices as specified in 7.1.

NOTE This is to ensure that the rail attributes, described in the introduction, which are not known in an exact manner or are not practically measurable, achieve the required high level of product integrity in track.

7.2 Blooms

Blooms made from basic oxygen steel or electric arc furnace steel that has been secondary ladle arc refined, vacuum degassed and continuously cast, shall be used for the manufacture of rails.

7.3 Rails

7.3.1 The manufacturer shall operate a procedure for the effective removal of scale during the rolling and straightening processes.

7.3.2 The cross-sectional area of the rail shall not exceed one ninth that of the bloom from which the rail is rolled.

7.3.3 Rail straightening shall be by a two stage roller straightening process which straightens the rail about its XX and YY axes as defined in the rail profiles shown in annex A. End deviations or a localised deviation on the rail may be corrected using pressing.

NOTE Other mandatory processes are described in the relevant clauses within the standard.

7.4 Identification

7.4.1 Branding

Brand marks shall be rolled in relief on one side and in the middle of the web (see annex A) of each rail at least once every 4 m. The brand marks on the rails shall be clearly legible and shall be 20 mm to 25 mm high, raised between 0,6 mm and 1,3 mm.

The branding line(s) to denote grade shall be 50 mm in length for the long branding line and 25 mm in length for the short branding line.

The brand marks shall include:

a) the identification of the mill;

b) the steel grade as shown in Table 1;

c) the last two figures of the year of manufacture;

d) the rail profile identification as shown in annex A.

EXAMPLE

ROLLING MILL ___ 96 60 E 1

(60 E 1 profile rail rolled 1996 and 260 HBW carbon-manganese rail steel grade).

ROLLING MILL ___ _____ _____ 96 60 E 1

(60 E 1 profile rail rolled 1996 and 350 HBW heat treated carbon-manganese rail steel grade).

7.4.2 Hot stamping

In addition to the branding requirements of 7.4.1 each rail shall be identified by a numerical and/or alphabetical code system, hot stamped on the non-branded side of the rail web by machine and each rail shall be hot stamped at least once every 5 m.

If hot stamping every 5 m is not practical, the identity of the rail shall be applied by hot stamping or rotary burn near the end of the rail.

NOTE Subsequent cutting could result in more than one rail length having the same identity.

The figures and letters used shall be clearly legible and shall be 16 mm high. The stamped characters shall have a flat or radius face (1 mm to 1,5 mm wide) with bevels on each side. The letters and numbers shall be on a 10° angle from vertical and shall have rounded corners. The stamping shall be between 0,5 mm and 1,5 mm in depth along the centre of the web. The design shall be as shown in Figure 1.

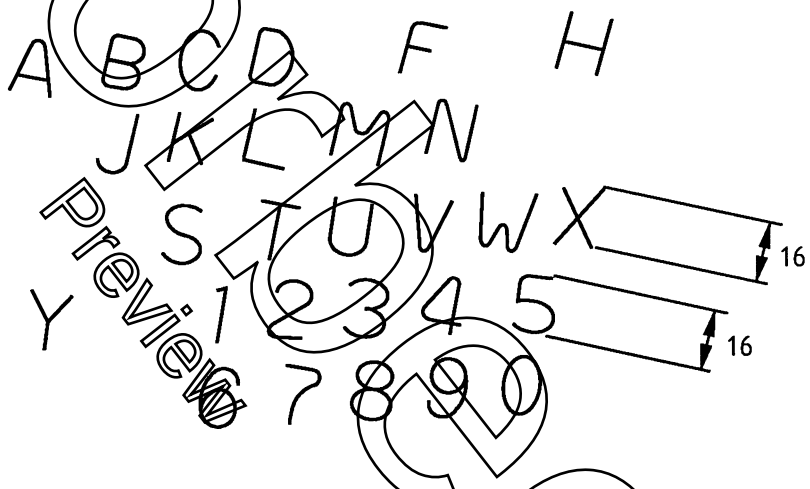

Figure 1 — Design of letters and numbers on a 10° angle for rail stamps

The identification system employed shall be such as to enable the hot stamped marking to be collated with:

a) the number of the heat from which the rail has been rolled;

b) the number of the strand and position of bloom within the strand;

c) the position of the rail in the bloom (A, B ... Y).

In the event of identification marks having been removed, omitted or requiring alteration, re-identification of such marks shall be made by rotary burr.

7.4.3 Cold stamping

Cold stamping shall only be used on the cut face of the rail within the central portion of the head, at the request of the purchaser.

7.4.4 Other identification

Rails of straightness class A shall be identified with a green mark and the position of the green mark is to be specified by the purchaser. The steel grade may additionally be identified using paint. The purchaser shall specify the colour and position of the paint application.

NEN
CONNECT

ALTIJD DE ACTUELE NORM IN UW BEZIT HEBBEN?

Nooit meer zoeken in de systemen en uzelf de vraag stellen: ‘Is NEN-EN 13674-1:2003 en de laatste versie?’

Via het digitale platform NEN Connect heeft u altijd toegang tot de meest actuele versie van deze norm. Vervallen versies blijven ook beschikbaar. **U en uw collega’s** kunnen de norm via NEN Connect makkelijk raadplagen, online en offline.

Kies voor slimmer werken en bekijk onze mogelijkheden op **www.nenconnect.nl**.

Heeft u vragen?

Onze Klantenservice is bereikbaar maandag tot en met vrijdag, van 8.30 tot 17.00 uur.

Telefoon: 015 2 690 391
E-mail: klantenservice@nen.nl