



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS E 1201 : 1997

(Reaffirmed : 2003)

Prestressed concrete sleepers— Pretensioning type

ICS 45.080

Descriptors : sleepers, pretensioned prestressed concrete, prestressed concrete, railway track

Reference number : JIS E 1201 : 1997 (E)

PROTECTED BY COPYRIGHT

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS E 1201 : 1990** is replaced with **JIS E 1201 : 1997**.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Date of Establishment: 1990-02-01

Date of Revision: 1997-11-20

Date of Reaffirmation: 2003-01-20

Date of Public Notice in Official Gazette: 2003-01-20

Investigated by: Japanese Industrial Standards Committee

Divisional Council on Railways and Rolling
Stock

JIS E 1201 : 1997, First English edition published in 2004-06

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2004

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED FY COPYRIGHT

Prestressed concrete sleepers— Pretensioning type

1 Scope This Japanese Industrial Standard specifies sleepers, of a type introducing compressive force into concrete by using prestressing steel strands, to be used for railways (hereafter referred to as “sleepers”).

Remarks : The normative references to this Standard are listed in Attached Table 1.

2 Classification Sleepers shall be classified by the shape as shown in Table 1.

Table 1 Classification

Classification	Symbol	Use	Shape
No. 3	3PR	1 067 mm gauge	Attached Fig. 1
No. 6	6PR		Attached Fig. 2
No. 7	7PR		Attached Fig. 3
For cable protection	CPR		Attached Fig. 4
For joint	JPR		Attached Fig. 5
For special section	SPR		Attached Fig. 6
3T	3T	For standard gauge	Attached Fig. 7
3H	3H		Attached Fig. 8

3 Performance

3.1 Bending strength of sleepers The bending strength of sleepers shall be as follows:

- (1) A sleeper, when it is subjected to the proof bending force given in Table 2 by the test method of 8.1 (1), shall not cause crazing.
- (2) For a sleeper, the load at which it is broken by the test method of 8.2 (1) shall exceed the destructive bending force given in Table 2.

Table 2 Proof and destructive bending force

Unit: kN

Symbol	Sectional rail position		Sectional sleeper mid.	
	Proof bending force	Destructive bending force	Proof bending force	Destructive bending force
3PR	81	139	50	86
6PR	82	136	67	120
7PR	63	104	40	67
CPR	81	128	68	113
JPR	108	181	80	141
SPR	98	157	72	123
3T	114	190	95	171
3H	190	300	120	203

3.2 Compressive strength of concrete For the concrete, the compressive strength by the testing according to 8.3 shall be at least 49.1 N/mm² in the strength of a cylindrical specimen at 28 days age, and it shall have sufficient durability and be less unevenness in qualities.

3.3 Air content of air-entrained concrete Where air-entrained concrete (AE concrete, see JIS A 0203) is used, its air content shall be (4.5 ± 1.0) % when tested according to 8.4.

3.4 Extraction strength of tie plug/collar The extraction strength of tie plug/collar shall be as follows:

- (1) The tie plug (or tie collar for JPR) in the sleeper, when subjected to a proof extracting force indicated in Table 3 by the testing method of 8.1 (2), shall not cause cracks or crazing on the sleeper.
- (2) The tie plug (or tie collar for JPR) in the sleeper, when subjected to a destructive extracting force given in Table 3 by the testing method of 8.2 (2), shall not be pulled out.

Table 3 Proof and destructive extracting force

Unit: kN

	Proof extracting force	Destructive extracting force
Tie plug	30	50
Tie collar	50	69

4 Shape and dimensions and their tolerances Attached Figs. 1 to 8 give the shape and dimensions and their tolerances. Among them, those without indication of dimensional tolerance are shown for a recommendation.

5 Appearance The appearance of sleepers shall be as follows:

- (1) A sleeper shall be free from harmful crazing, warp, twist, bent, surface blow hole, corner edge fracture and the like.
- (2) There shall be no harmful curvature on the rail seat surface.
- (3) The support plug of No. 3 sleeper shall be fixed securely without lift, recess, peeling and the like.

6 Materials

6.1 Cement The cement used shall be normal portland cement or high-early-strength portland cement of **JIS R 5210** or that at least equivalent thereto.

6.2 Aggregate The aggregate shall be as follows:

- (1) The aggregate shall be clean, strong and durable, and shall not contain harmful amount of dust, dirt, chlorides, organic impurities and the like.

The aggregate shall be such that judged harmless by the testing of Annex 7 or 8 of **JIS A 5308**. Excepting the case where a measure of retarding alkali-aggregate reaction has been taken according to Annex 6 of the said standard.

- (2) The aggregate shall be 20 mm in maximum size and, where crushed stone is used, the quality shall conform to **JIS A 5005**.
- (3) For the fine aggregate use of sea sand is forbidden. Where use it unavoidably, sufficiently washing with water shall be made.

6.3 Water The water shall not contain harmful amount of oils, acids, salts, organic impurities and the like.

6.4 Admixture Admixtures, if used, shall not affect harmfully the quality of the sleeper.

Where use of chemical admixture is intended, it shall be that specified in **JIS A 6204**.

6.5 Prestressing steel strand The steel strands for prestressing concrete shall be 2.9 mm 3-wire strand (SWPD3N or L) of **JIS G 3536**.

6.6 Spiral wire and stirrup The spiral wires and stirrups shall be of low carbon steel wire of **JIS G 3532**.

6.7 Tie plug, tie collar and support plug The tie plug, tie collar and support plug shall be in accordance with **JIS E 1118**.

6.8 Insert The inserts (in the case of CPR) shall be of SD295A of **JIS G 3112** in material, of shape and dimensions as shown in Attached Fig. 4 and treated with hot-dip zinc coating or other means of rust proof at least equivalent thereto.

7 Manufacture

7.1 Bar arrangement The placing of the prestressing strands and other reinforcements shall be as shown in Attached Figs. 1 to 8.

7.2 Concrete The concrete shall be as follows:

- (1) For the mix proportion, consideration is given on the required strength and durability, the unit water amount shall be reduced as lesser as possible within the range of being suitable for work.
- (2) The mixing of concrete shall be made sufficiently as the concrete mixed being in homogeneous condition.
- (3) The chloride content in the concrete, when tested according to 8.5, shall be at most 0.30 kg/m^3 in Cl^- .
- (4) The placing of concrete shall be made by a means of firmly filling.
- (5) When the placing of concrete is completed, curing shall be made with sufficient moisture given. The steam or hot water curing, if these are employed, shall be made as exert no harmful influence on the quality of the sleeper.

7.3 Tensity of prestressing strand The tensity to be applied to the prestressing steel strand shall be so made as the tensile force, after fixing both strand ends, being at the value given in Table 4. Even for the case where a high temperature accelerative curing is employed, if the tensing up is carried out by using a fixture exerting no influence on the strand tensity, the tensile force for atmospheric temperature moist curing shall apply.

Table 4 Tensile force per wire of prestressing strand

Unit: kN

Symbol	In the case of atmospheric temperature moist curing	In the case of high temperature accelerative curing
3PR	28.7 ± 0.5	31.0 ± 0.5
6PR 7PR	30.3 ± 0.5	31.8 ± 0.5
CPR JPR SPR	28.7 ± 0.5	31.0 ± 0.5
3T 3H	30.3 ± 0.5	31.8 ± 0.5

7.4 Mutual positioning of prestressing strands and form The positional deviation mutually between the prestressing strands and the form shall be not more than 2 mm.

7.5 Introduction of prestress The prestress shall be introduces as follows:

- (1) The compressive strength of concrete in being prestressed, when tested according to **8.3**, shall be at least 39.2 N/mm^2 in the case of test on a cylindrical specimen or at least 44.1 N/mm^2 for a cubic specimen.

These specimens shall be subjected to the same curing as the products.

- (2) The tensile force shall be removed gradually from the prestressing strand without impacting.

7.6 Treatment of sleeper end face For the sleeper end face, after cutting off the strand remnants as no projection from the surface, appropriate rust proof treatment shall apply.

7.7 Shipping The shipping shall be made after completion of inspections of **9.1**, **9.2** and **9.4** to confirm conformity with the requirements.

8 Testings

8.1 Proof bending test of sleeper and proof extracting test of tie plug/collar The proof bending test of sleeper and the proof extracting test of tie plug/collar shall be carried out at a rate of one sleeper per batch, regarded the sleepers prestressed at the same time as a lot, and as follows:

These tests shall be made after the compressive strength of the specimen, which is a cylindrical specimen subjected to the same curing as the products, has attained at least 49.1 N/mm^2 .

- (1) The proof bending test of a sleeper shall be carried out according to the loading method shown in Attached Fig. 9.
- (2) For the proof extracting test of tie plug/collar, the extracting force shall apply gradually onto the bolt by the loading method shown in Attached Fig. 10.

8.2 Destructive bending test of sleeper and destructive extracting test of tie plug/collar The destructive bending test of sleeper and the destructive extracting test of tie plug/collar shall be carried out at a rate of one sleeper per batch, regarded 1 000 sleepers of the same type as a batch in the order of manufacture, and as follows:

These tests shall be made after the compressive strength of the cylindrical specimen subjected to the same curing has attained at least 49.1 N/mm^2 .

- (1) The destructive bending test of a sleeper shall be carried out according to the loading method shown in Attached Fig. 9.
- (2) For the destructive extracting test of a tie plug/collar, the extracting force shall apply gradually onto the bolt according to the loading method shown in Attached Fig. 10.

8.3 Compressive strength test of concrete The test method for the compressive strength of concrete shall be in accordance with **JIS A 1108** and the making method of the specimen, with **JIS A 1132**.

In the case of using cubic specimen of $(15 \times 15 \times 15) \text{ cm}$ for the compressive strength test in the state of being prestressed, **JIS A 1132** similarly applies.

The test frequency shall generally be once per working 4 h of mixing concrete. The one test result shall be expressed in the average of three specimens made of samples taken from an optional batch.

8.4 Air content test of air-entrained concrete The air content of air-entrained concrete shall be tested by any method of **JIS A 1116**, **JIS A 1118** or **JIS A 1128**.

The test frequency shall generally be a rate of once per working 4 h of mixing concrete.

8.5 Chloride content of concrete The chloride content of concrete shall be tested according to the specification of **8.5** of **JIS A 5308**.

9 Inspections

9.1 Proof bending inspection of sleeper and proof extracting inspection of tie plug/collar For the proof bending inspection of sleeper and the proof extracting inspection of tie plug/collar, when the tests of **8.1** are carried out, the results shall meet the requirements of **3.1 (1)** and **3.4 (1)** respectively.

9.2 Destructive bending inspection of sleeper and destructive extracting inspection of tie plug/collar For the destructive bending inspection of sleeper and the destructive extracting inspection of tie plug/collar, when the tests of **8.2** are carried out, the results shall meet the requirements of **3.1 (2)** and **3.4 (2)** respectively.

9.3 Compressive strength inspection of concrete The compressive strength inspection of concrete, when the test of **8.3** is applied, shall result in conforming to the requirements of **3.2**.

9.4 Shape and dimensions and appearance inspection Sleepers shall be inspected for the shape and dimensions and appearance to meet clauses of **4** and **5**.

10 Designation Sleepers shall be designated by the number or title of the Standard and the classification or its symbol.

Example 1 JIS E 1201 3PR

Example 2 Prestressed concrete sleeper—Pretensioning type, No. 3

11 Marking Sleepers shall be stamped with the following information at an obvious place nearly the end on the top surface.

- (1) Symbol of the type
- (2) Manufacturer's name or abbreviation
- (3) Abbreviation of year manufactured (latter double figures in Christian era)