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JIS E 1303 : 2001

Railway turnouts and crossings

ICS 45.080

Descriptors : turnouts, diamond crossings

Reference number : JIS E 1303 : 2001 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Land, Infrastructure and Transport through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS E 1303 : 1993** is replaced with **JIS E 1303 : 2001**.

Conformity to this Standard may come under employment of the following patent rights.

- | | | |
|---|------------------------|---|
| 1 | Title of the invention | Railway crossing |
| | Date of registration | 1984-6-28 (relating to pressure welded railway crossing) |
| 2 | Title of the invention | Welded crossing and its production method |
| | Date of registration | 1988-1-30 (relating to non-groove electron beam welding crossing) |

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These patentees ensure, to Japanese Standards Association, intending to license anybody indiscriminately to the said patent rights on rational conditions.

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Railway turnouts and crossings

1 Scope This Japanese Industrial Standard specifies railway turnouts and crossings of 1 067 mm and 1 435 mm gauges (hereafter referred to as “turnouts and/or crossings”). This Standard does not apply to those for SHINKANSEN railways based on the National SHINKANSEN network Law.

2 Normative references The standards listed in Attached Table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of those standards (including amendments) shall be applied.

3 Definitions For the main terms used in this Standard, the following, besides the definitions in JIS E 1311, shall apply.

- a) **non-groove electron beam welding crossing** A crossing welded by irradiation of electron beam in a vacuum circumference with the welding surfaces of the rail base materials being in contact closely each other without forming grooves.

4 Classification of turnouts and crossings To be classified into the following 4 types:

- a) Simple turnout
- b) Symmetrical turnout
- c) Diamond crossing
- d) Run-over type turnout

5 Construction, shape and dimensions

5.1 Construction A turnout consists of switch, crossing, guards and rails, and a diamond crossing consists of obtuse crossing, crossings, guards and rails.

Figs. 1 and 2 show examples of constructions.

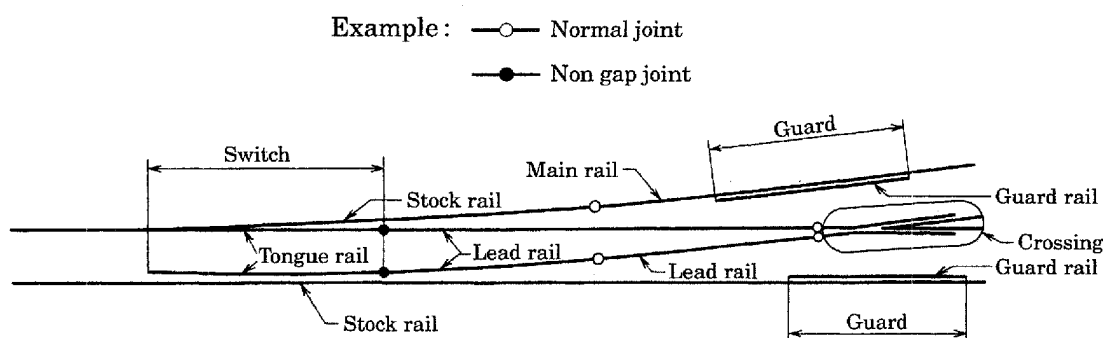


Fig. 1 Example of simple turnouts

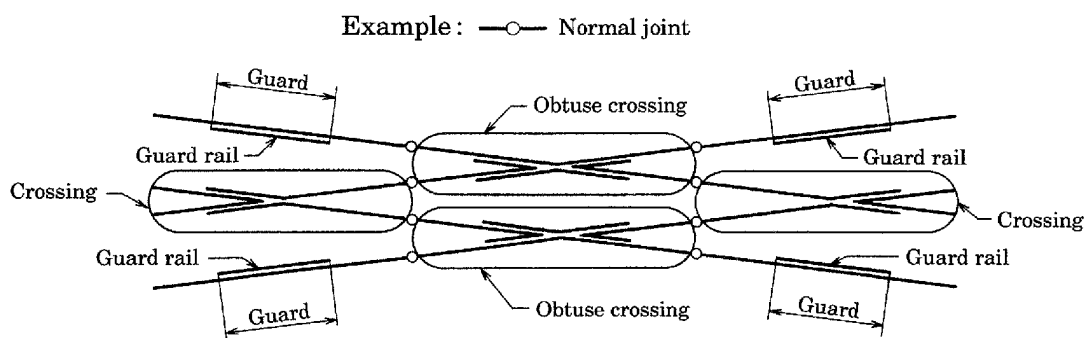


Fig. 2 Example of diamond crossings

5.2 Shape and dimensions

5.2.1 Geometry For the geometry of turnouts and crossings, **JIS E 1304** applies.

5.2.2 Shape and dimensions of switch For the shape and dimensions of switches, **JIS E 1305** applies.

5.2.3 Shape and dimensions of crossing For the shape and dimensions of crossings, **JIS E 1306** applies.

5.2.4 Shape and dimensions of guard For the shape and dimensions of guards, **JIS E 1307** applies.

5.2.5 Dimensional tolerance Dimensional tolerances shall be as follows:

- Switches, crossings and guards shall be as given in Attached Figs. 1 to 15.
- Unless otherwise specified particularly, bolts and nuts shall meet grade C of **JIS B 1180** and **JIS B 1181**.
- Split pins shall comply with **JIS B 1351**.
- Rivets shall comply with **JIS B 1214**.
- The spherical countersunk hole on floor plates intended to hold the head of rail fixing bolts shall be formed in such dimensions as that head top surface of bolts having basic sizes will recess 0.5 mm to 1.5 mm inside the bottom surface of floor plates.
- When bolt locking washers, fish plates and the like have a stop groove, those on the groove shall be ± 0.5 mm in width and ± 0.5 mm in depth.
- To be ± 0.5 mm for the hole diameter of bolts and the like, and $^{+1.5}_{-0.5}$ mm for the side length of rail spikes which are not specified in the attached figures.

5.2.6 Shop assembling turnouts and crossings Shop assembling turnouts and crossings shall comply with Annex 1 besides the provisions of **5.2.1** to **5.2.5**.

6 Materials

6.1 Rails The material of rails to be used for turnouts and crossings shall be in accordance with **JIS E 1101** and **JIS E 1120**. For slack quenching S rails, however, Annex 2 shall apply.

6.2 Pressure welded crossing The material of rails to be used for pressure welded crossings shall comply with **JIS E 1101** and **JIS E 1120**. This applies to 100 kg rails⁽¹⁾ similarly.

Note ⁽¹⁾ A rail having specific sectional shape, of which approximate value of mass per 1 m is stated in numerals, to be used for forming nose rail toe.

6.3 Non-groove electron beam welding crossing The material of rails to be used for non-groove electron beam welding crossings [hereafter referred to as "NEW crossings" (abbreviation)] shall comply with **JIS E 1120**.

6.4 Manganese steel crossing The material of manganese steel crossings shall be SCMnH3 of **JIS G 5131**.

6.5 Components For the material of components of turnouts and crossings, those indicated in Table 1 or at least equivalent thereto shall be used.

Table 1 Material of component

Name of component	Material	Applicable provisions for shape and dimensions
Switch rod	SS400 of JIS G 3101	Attached Figs. 7.1 and 7.2 of JIS E 1305
	SM400A of JIS G 3106	Attached Figs. 1.2 to 1.5, 3.10, 3.11, 8.3 and 9.3 of JIS E 1305
		Attached Figs. 14.2, 14.3 and 17.4 of JIS E 1306
Stretcher bar	SS400 of JIS G 3101	Attached Fig. 3.12 of JIS E 1305
	SM400A of JIS G 3106	Attached Figs. 1.6, 1.7, 8.4 and 9.4 of JIS E 1305
Bearing clip	SS400 of JIS G 3101	Attached Figs. 7.3 to 7.6 and 8.5 of JIS E 1305
	SM400A of JIS G 3106	Attached Figs. 1.8, 3.13 to 3.17 and 6.2 of JIS E 1305
		Attached Figs. 14.4, 17.5 and 17.6 of JIS E 1306
Stud	SS400 of JIS G 3101 or FCD400 of JIS G 5502	Attached Figs. 1.9, 3.18 to 3.21 and 7.7 of JIS E 1305
		Attached Figs. 14.5, 17.7 and 17.8 of JIS E 1306
Filler	SS400 of JIS G 3101 or SC450 of JIS G 5101	Attached Figs. 1.10, 1.11, 6.3, 6.4, 7.8 and 7.9 of JIS E 1305
		Attached Figs. 1 to 6 ⑥ ⑦, 7 to 10 ⑦ ⑧, 12 ⑥ ⑦, 13 ⑫ to ⑮, 14.10 and 14.11 of JIS E 1306
	SS400 of JIS G 3101	Attached Figs. 14.6 to 14.9 of JIS E 1306
	FC200 of JIS G 5501	Attached Figs. 1 ⑤ ⑧ to ⑬, 2 ⑤ ⑧ to ⑩, 3 ⑤ ⑧ to ⑮, 4 ⑤ ⑧ to ⑬, 5 ⑤ ⑧ to ⑩, 6 ⑤ ⑧ to ⑮, 7 ⑥ ⑨ to ⑮, 8 ⑥ ⑨ to ⑮, 9 ⑥ ⑨ to ⑮, 10 ⑥ ⑨ to ⑮, 11 ⑤ to ⑪, 12 ⑤ ⑧ to ⑫, 13 ⑦ to ⑪ ⑮ to ⑮, 20 ③ ④ and 21 ③ to ⑤ of JIS E 1306
		Attached Figs. 1.1, 8.1, 9.1 to 9.4 of JIS E 1307

Table 1 (continued)

Name of component	Material	Applicable provisions for shape and dimensions
Fish plate	SS400 of JIS G 3101	Attached Figs. 1.12, 6.5, 6.6, 7.10, 7.11, 8.6 to 8.8, 9.5 and 9.6 of JIS E 1305
		Attached Fig. 14.12 of JIS E 1306
	SS400 of JIS G 3101 or SC450 of JIS G 5101	Attached Figs. 14.13 to 14.16 of JIS E 1306
Collar	S30C to S45C of JIS G 4051 heat-treated into a hardness of HS 30 to 45	Attached Figs. 1.13, 7.12 and 8.9 of JIS E 1305
		Attached Fig. 14.17 of JIS E 1306
Washer	SS400 of JIS G 3101 or FCD400 of JIS G 5502	Attached Figs. 1.14 to 1.20, 3.22 to 3.34, 7.13 to 7.19, 8.10 to 8.12 and 1.29 ② of JIS E 1305
		Attached Figs. 1 ⑭ to ⑰, 2 ⑪ to ⑭, 3 ⑯ to ⑲, 4 ⑬ to ⑰, 5 ⑪ to ⑭, 6 ⑯ to ⑲, 7 ⑯ to ⑲, 8 ⑰ to ⑳, 9 ⑯ to ⑲, 10 ㉒ to ㉓, 11 ⑫ to ⑮, 12 ⑬ to ⑯, 13 ㉒ to ㉔, 14.18 to 14.26, 17.9 to 17.16, 17.19, 20 ⑤ to ⑦ and 21 ⑥ to ⑩ of JIS E 1306
		Attached Figs. 1.2 to 1.6, 4.1 to 4.3, 9.5, 9.6, 10.1 to 10.4 and 11.1 of JIS E 1307
	SS400 of JIS G 3101 , SC450 of JIS G 5101 or FCD400 of JIS G 5502	Attached Fig. 1.29 ① of JIS E 1305
	Heat-treated SUP6, SUP9 of JIS G 4801 , SK5 or SK7 of JIS G 4401	Attached Fig. 1.30 of JIS E 1305
		Attached Figs. 17.17, 17.18 of JIS E 1306
Rail brace	SS400 of JIS G 3101 , SC450 of JIS G 5101 or FCD450 of JIS G 5502	Attached Figs. 1.21, 3.35 to 3.37 and 8.13 of JIS E 1305
		Attached Figs. 14.27, 14.28, 17.20 and 17.21 of JIS E 1306
	FC200 of JIS G 5501	Attached Fig. 7.20 of JIS E 1305
		Attached Fig. 9.7 of JIS E 1307
Base plate	SS400 of JIS G 3101	Attached Figs. 1.22 to 1.28, 3.38 to 3.54, 7.21 to 7.23, 8.14 to 8.17 and 9.7 to 9.9 of JIS E 1305
		Attached Figs. 11 ㉒ ㉓, 14.29 to 14.43 and 17.22 to 17.40 of JIS E 1306
		Attached Figs. 1.7, 4.4, 4.5, 8.2, 9.8, 9.9, 10.5, 10.6 and 11.2 of JIS E 1307
Bolt	SS490 of JIS G 3101	Attached Figs. 3 ㉓, 4 ㉔ and 5 ㉕ of JIS E 1305
		Attached Figs. 17 ㉓, 18 ㉔ and 19 ㉕ of JIS E 1306
	S45C to S55C of JIS G 4051 heat-treated into a hardness of HB 255 to 331 (²)	Attached Figs. 1 ㉖ to ㉗, 2 ㉘ to ㉙, 6 ㉚ to ㉛, 7 ㉜ to ㉝, 8 ㉞ to ㉟ and 9 ㊱ to ㊲ of JIS E 1305
		Attached Figs. 1 ⑱, 2 ⑮, 3 ㉚, 4 ⑱, 5 ⑮, 6 ㉚, 7 ㉚, 8 ㉚, 9 ㉚, 10 ㉚, 11 ⑮, 12 ⑰, 13 ㉘, 14 ㉚ to ㉛, 15 ㉘ to ㉙, 16 ㉚ to ㉛ and 20 ⑧ of JIS E 1306
		Attached Figs. 1, 2, 3 ⑩, 8 ⑩, 9 ⑨, 10 and 11 ⑧ of JIS E 1307

Table 1 (concluded)

Name of component	Material	Applicable provisions for shape and dimensions
Bolt	To be grade B property class 10.9 of JIS E 1107	Attached Figs. 3 ③⑥ to ③⑨, 4 ②⑧ to ③① and 5 ③⑤ to ③⑧ of JIS E 1305
		Attached Figs. 17 ③④ to ③⑦, 18 ③⑨ to ④②, 19 ③① to ③④ and 21 ①① to ①④ of JIS E 1306
		Attached Figs. 1,2,3 ⑨, 4,5,6,7 ⑦ ⑧, 8 ⑨, 10 and 11 ⑦ of JIS E 1307
Nut	At least SS400 of JIS G 3101	Nuts to be mated with a bolt of SS490 of JIS G 3101 in material
	S45C to S55C of JIS G 4051 heat-treated ⁽²⁾	Nuts to be mated with a bolt of S45C to S55C of JIS G 4051 heat-treated in material or that according to grade B of JIS E 1107
Fang bolt	SS400 of JIS G 3101	Attached Fig. 7 ②⑤ of JIS E 1305
		Attached Fig. 9 ⑩ of JIS E 1307
Spring washer	No. 2 of JIS B 1251	Attached Fig. 3.12 of JIS E 1305
	JIS E 1115	—
Rivet	SV400 of JIS G 3104	—
Split pin	SWRM12 of JIS G 3505	—

Note ⁽²⁾ For those according to the following attached figures, materials at least equivalent to SS400 of **JIS G 3101** may be used.

Attached Figs. 3 ③⑧, 4 ③⑩, 5 ③⑦ and 7 ②② to ②④ of **JIS E 1305**

Attached Figs. 11 ①⑥, 14 ②⑨, 15 ②⑧, 16 ②⑨, 17 ③⑤, 18 ④⑩ and 19 ③② of **JIS E 1306**

Attached Fig. 9 ⑨ of **JIS E 1307**

7 Manufacture and processing

7.1 Processing of rail

7.1.1 Cutting Machinings shall be taken for cutting rails, fusing and breaking cuts shall not be permitted.

7.1.2 Bending For bending rails or correcting the warp, such means shall be taken so as not to affect the qualities.

7.1.3 Forming For the forming of the head, bottom and web of rails, machining or hot-forging process shall apply. In the case of hot-forging, such a means shall be taken so as not to affect the qualities.

7.1.4 Drilling The drilling of rails ⁽³⁾ shall be by means of machining.

Note ⁽³⁾ The following drillings shall be made after the bending process.

- Switch rod and bearing clip attaching holes on a movable rail
- Holes nearby bending point on a tongue rail

7.1.5 Finishing Finishings shall be as follows:

- a) The roughness of finished surfaces after the forming of **6.1.3** shall be $36 \mu\text{m } R_y$ of **JIS B 0601**, excepting $12.5 \mu\text{m } R_y$ for the roughness of cylindrical surfaces to be in contact with a turnout fish plate at the heel of tongue rail indicated in Attached Figs. 1.1, 2.1 of **JIS E 1305** and of movable rail shown in Attached Fig. 14.1 of **JIS E 1306**.
- b) Chamferings shall be applied to the edge of machined surfaces of the holes and rail bottom side as shown in Fig. 3 a) ⁽⁴⁾. Further, the bottom side edges of flexible portion of tongue rails given in Attached Figs. 3.3, 3.4, 3.7, 3.8, 4.2, 4.3, 5.4, 5.5 and 5.9 to 5.12 of **JIS E 1305** and of movable rails given in Attached Fig. 17.2 of **JIS E 1306** shall be rounded in $R5 \text{ mm}$ and $R8 \text{ mm}$ as shown in Fig. 3 b).

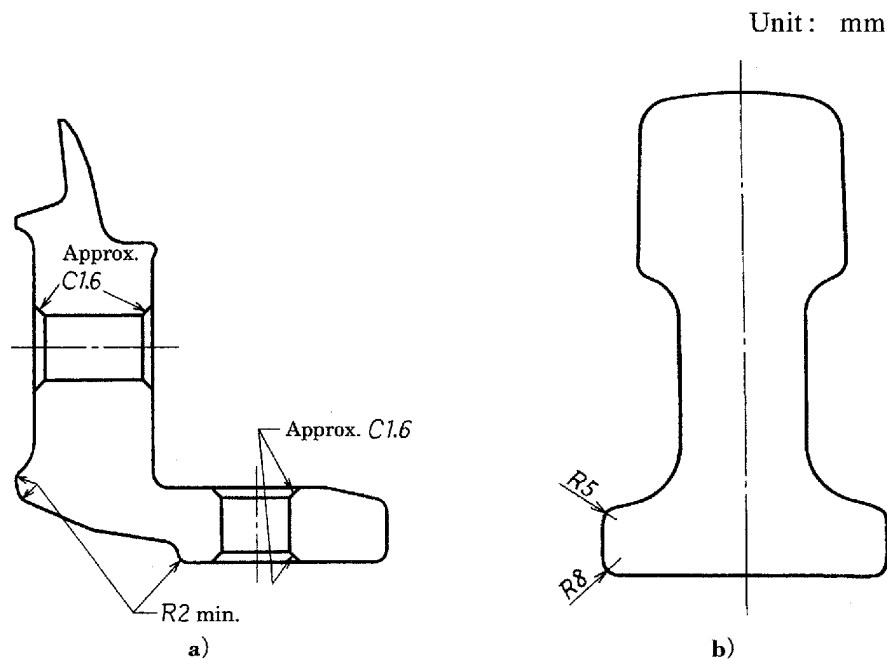


Fig. 3

Note ⁽⁴⁾ These drawings, which illustrates a tongue rail as an example, also apply to a guard rail and others.

- c) For the edge of rail ends to be fitted with a fish plate, chamfering of approximate 1.6 mm shall be made on the head to upper neck part as shown in Fig. 4.

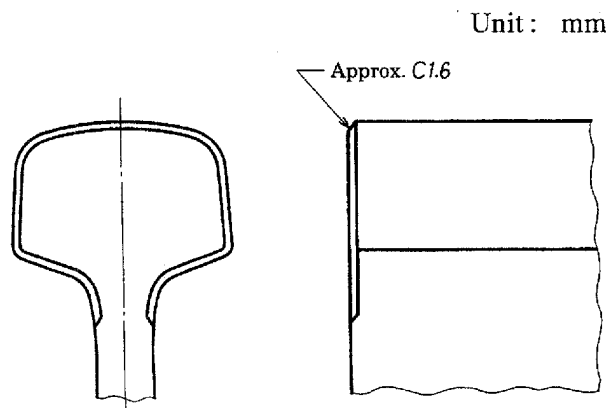


Fig. 4

- d) Burrs, fins and the like shall be removed.

7.1.6 Heat treatment Where a rail is heat-treated, to be as follows:

- a) Table 2 gives the rails to be subjected to heat treatment.

Table 2 Rails to be heat-treated

Item	Rails to be heat-treated
Switch	Tongue rail
Crossing	Wing rail, nose rail, guard rail, movable rail, knuckle rail
Guard	Guard rail

- b) For the heat treatment, quenching and tempering (hereafter referred to as “QT”) or slack quenching method (hereafter referred to as “SQ”) shall apply.
- c) After being subjected to heat treatment, the treated part shall not be heated at a temperature of 500 °C or higher.

7.1.7 Welding The welding of rails shall be as follows:

- a) Weldings shall not apply on portions other than those indicated.
- b) There shall be no detrimental defects on the welded portion.

7.2 Processing of components

7.2.1 Cutting, bending and forming For the cutting, bending and forming, such means shall be taken so as not to damage the qualities.

7.2.2 Drilling The drilling in components shall be as follows:

- a) **By means of machining** Holes in switch rod, stretcher bar, bearing clip, fish plate and run-over block.
- b) For a projection up to 3 mm generated by punching the spike hole, finishing does not need to be applied.

7.2.3 Welding The welding on components shall be as follows:

- a) Weldings shall not apply on portions other than those indicated.
- b) There shall be no detrimental defects on the weld zone.
- c) Components other than cast products may be subjected to cladding by welding with a minimal influence on the strength.

7.2.4 Finishing Finishings shall be as follows:

- a) The surface roughness of base plate on which tongue rail or movable rail will slide shall be $36 \mu\text{m } R_y$ of **JIS B 0601**.
- b) For the fish plates shown in Attached Fig. 1.12 of **JIS E 1305** and Attached Fig. 14.12 of **JIS E 1306**, the surface to be in contact with a tongue rail or movable rail shall be finished at $12.5 \mu\text{m } R_y$ in roughness of **JIS B 0601**.
- c) The roughness of the other machined component surfaces than those above mentioned in a) and b) shall be $50 \mu\text{m } R_y$ of **JIS B 0601**.

7.2.5 Rivet hole The diameter of rivet holes shall not exceed the dimensional value given in Table 3 above the nominal rivet diameter.

Table 3 Rivet holes

Unit: mm

Position		Rail type	
		Up to 50 kg	50 kg or more
Rail bottom		3	4
Rail web in crossing	Of crossing No. 4 or less	3	
	Of crossing No. over 4	2	
Others		To conform to JIS B 1214 .	

7.3 Manufacture of pressure welded crossing

7.3.1 Welding The welding of pressure welded crossings shall be as follows:

- a) For the arc welding, shielded metal arc welding or CO_2 gas shielded arc welding shall be employed.

The welding rod to be used shall be high-tension steel CO_2 gas arc welding solid wire, D7016 to D5816 of **JIS Z 3212** or equivalent thereto.

- b) For the pressure welding, a gas welding shall be employed.

In this case, the heating flame shall be treated into less reducing flame.

7.3.2 Bonding The bonding for pressure welded crossings shall be as follows:

- a) For the bonding agent, thermosetting epoxy resin shall be used.

- b) Rust and oils on the rail and filler surfaces to be bonded shall be removed sufficiently.

7.3.3 Finishing The finishing shall be made by means of cutting and grinding according to 7.1.5.

Information : The following patent is registered relating to pressure welded crossing.
Patent No. 1797248

7.4 Manufacture of NEW crossing

7.4.1 NEW crossings shall be welded as follows:

- a) Degrease and wash sufficiently the rail surface of the parts to be welded, fix those two rails closely with no clearance between them.
- b) For the rails to be welded, after pre-heating sufficiently, insert them into a welding chamber, allow the inside to be at a vacuum state of 6.6×10^{-2} Pa or lower, and then irradiate an electron beam to weld.

7.4.2 Finishing The finishing shall be made by means of cutting and grinding according to 7.1.5.

Information : The following patent is registered relating to NEW crossing.
Patent No. 195438

7.5 Manufacture of solid manganese steel rigid crossing Besides in compliance with JIS G 5131, the manufacture of solid manganese steel rigid crossings shall be as follows:

- a) **Fusing cut** Where cut-off fusing is applied, any machining allowance shall be remained so as to prevent lowering the quality.
- b) **Drilling** The drilling shall be made by means of machining, by which fins and burrs shall be removed. For the spike holes, however, cast forming may be employed.
- c) **Finishing** The finishing shall be in accordance with the following, then it shall be made by means of cutting and grinding, by which burrs and fins shall be removed.
- 1) The roughness of the surface to be in contact with wheels, rail or fish plate shall be $50 \mu\text{m } R_y$ of JIS B 0601.
 - 2) The roughness of the surface to be in contact with a sleeper or base plate shall be $70 \mu\text{m } R_y$ of JIS B 0601.
 - 3) Holes, except spike holes, shall be chamfered to approximately 1.6 mm.
 - 4) The edge of the rail end to be fitted with a fish plate shall be chamfered to approximately 1.6 mm on the head to upper neck part.
- d) **Casting defects** There shall not be such detrimental defects as cavity, shrinkage concave, pores, cracks, piping, cold shut and sand inclusion.

Mending weld may be applied providing less influence on strength is expected. In this case, after removing the failed part, such mending shall be made by means of arc welding with a high quality austenitic welding rod.

8 Quality

8.1 Quality of heat-treated rails

8.1.1 Hardness of top surface The surface hardness of the top area, when tested according to 9.2.1, shall be 45 HS to 55 HS for QT, or 46 HS to 56 HS for SQ. Further, the difference between the maximum and minimum values in every single rail shall be at most 6 HS.

8.1.2 Shape of sectional hardened layer The shape of hardened layer on a cross section of the rail, when tested by 9.2.2, shall be as shown in Fig. 5.

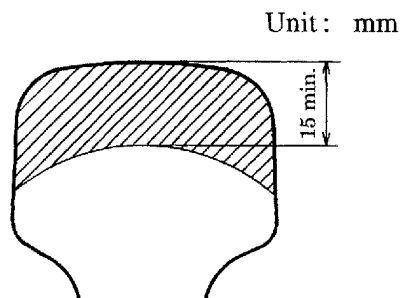


Fig. 5 Shape of hardened layer

8.1.3 Hardness distribution in sectional hardened layer Hardnesses of the hardened layer determined on a rail section shall be so distributed as lowering gradually from the rail surface without drastic change and discontinuity. Further, there shall be no portion of 402 HV, or 56 HS or higher for QT, and of 410 HV, or 57 HS or higher in SQ.

8.2 Quality of rail weld zone The weld zone shall be free from weld crack, incomplete penetration, incomplete fusion, under cut, slag inclusion, blow hole and so on. Further, after testing by 9.3 it shall meet class 1 defined in clause 2 of Annex 6 of JIS Z 3060.

9 Tests

9.1 Determination of surface roughness The roughness of the finished surface of rails, pressure welded crossing, NEW crossing, solid manganese steel rigid crossing and components shall be determined by comparison with the reference piece defined in JIS B 0659 or that produced based on JIS B 0601.

9.2 Tests for heat treated rail

9.2.1 Top surface hardness test The surface hardness of the top area shall be determined as follows:

- a) **Specimen and measuring position** The test shall be made on actual product, and the measurement position shall be at the both ends and central, i.e. 3 points for all the products.
- b) **Test method** For the test method JIS Z 2246 applies.

9.2.2 Sectional hardened layer shape test The shape test of sectional hardened layer shall be as follows:

- a) **Specimen** For the specimen, take a rail of the same type as the product at least 500 mm in length, and apply heat treatment to it under the same conditions as the product.
- b) **Test piece** The test piece shall be the central cross section of the specimen.
- c) **Test method** For the test method, clause 6 of **JIS G 0559** shall apply.

9.2.3 Hardness distribution test of sectional hardened layer The hardness distribution in the sectional hardened layer shall be tested as follows:

- a) **Specimen and test piece** The specimen and test piece shall be according to a) and b) of 9.2.2.
- b) **Test method** For the test method, **JIS Z 2244** or **JIS Z 2246** shall apply.
- c) **Measuring position** The measurement shall be made on each position indicated by × marks in Fig. 6.

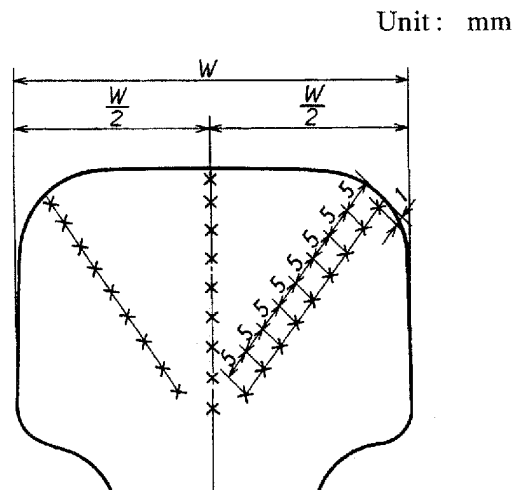


Fig. 6 Measuring positions

9.3 Rail weld zone tests

9.3.1 Test on arc weld zone The arc weld zone shall be tested by the methods specified in **JIS Z 2343-1** to **-4** and **JIS Z 3060**.

9.3.2 Test on pressure weld and electron beam weld zones The weld zone of pressure welding or electron beam welding shall be tested by the method specified in **JIS G 0565**, **JIS Z 2343-1** to **-4** and **JIS Z 3060**.

10 Inspection

10.1 Shape and dimensional inspection The shape and dimensions of turnouts and crossings inspected shall meet the requirements of 5.2.

10.2 Surface roughness inspection The surface roughness of turnouts and crossings inspected shall meet the requirements of 7.1.5 a), 7.2.4, 7.3.3 and 7.4 c).

10.3 Inspection on heat-treated rails

10.3.1 Top surface hardness inspection The surface hardness of top area inspected shall meet the requirements of 7.1.6 b) and 8.1.1.

10.3.2 Shape inspection on sectional hardness layer The shape of sectional hardness layer inspected shall meet the requirement of 8.1.2.

10.3.3 Hardness distribution inspection on sectional hardened layer The hardness distribution on sectional hardened layer inspected shall meet the requirement of 8.1.3.

10.4 Rail weld zone inspection The rail weld zone inspected shall meet the requirement of 8.2.

11 Packing Turnouts and crossings shall be packed as follows:

- a) For the tongue rail and movable rail having cylindrical surface in the heel and for the fish plate to be in contact therewith, general purpose grease as defined in **JIS K 2220** shall be applied to the both surfaces to be in contact with.
- b) For the machined rail surface and threaded positions, boiled oil or boiled linseed oil as defined in **JIS K 5421** or oil at least equivalent thereto shall apply. For other machined component surface, oils for treatment of rust proof purpose shall be applied.
- c) Protections shall be provided by using wooden pieces for the greased surface of tongue rail and movable rail having cylindrical surface and for toe area of all the tongue rails, and shall be by using hemp cloth for that of the fish plate.
- d) Pressure welded crossings, NEW crossings and solid manganese steel rigid crossings shall be packed after inspection by painting all over the surfaces with lacquer enamel of **JIS K 5531** or a paint at least equivalent thereto.

12 Marking

12.1 Switches, crossings, guards and components Switches, crossings, guards and components shall be marked as follows:

- a) Table 4 shows the marking for the respective products. Among them, the year of manufacture shall be indicated with the last two figures of the Christian Era, and the manufacturer's name and the use, with abbreviations.

For the turnout and crossing number, rail type, using position, direction and the like, necessary information shall be added clearly, by using white paint, on the part likely to be misread.

- b) **Marking on heat-treated rails** For the rail heat-treated as required in 7.1.6 a), besides applying Table 4, a name plate clearly indicating the following information shall be attached on the middle of rail web on the side easier to be seen. Attachment of the name plate in the cases of heat-treated crossing and rigid obtuse crossing shall be at a single portion on the wing rail for crossing or guard rail for rigid obtuse crossing.

- 1) Manufacturer's name or abbreviation
- 2) Heat treatment number

Table 4 Marking on products

Name of product	Marking item							Marking place ⁽⁷⁾
	Manufacturer's name	Year of manufacture	Turnout or crossing number	Rail type	Use ⁽⁵⁾	Filler width ⁽⁶⁾	Marking method	
Crossing	○	○	—	—	—	—	Stamping	Surface of heel of wing rail
Obtuse crossing	○	○	—	—	—	—	Stamping	Surface of heel of guard rail
Tongue rail Movable rail	○	○	—	—	—	—	Stamping	Surface of toe
Knuckle rail Guard rail	○	○	—	—	—	—	Stamping	End face
Switch rod	○	○	—	—	—	—	Stamping	Top
Stretcher bar	○	—	—	—	—	—	Stamping	Top
Filler (for switch)	○	—	○	○	—	—	Stamping or relief	End face or top
Filler (for crossing)	○	—	—	—	—	—	Stamping or relief	Top
Filler (for guard)	○	—	—	—	—	—	Stamping or relief	Top
	—	—	—	—	—	○	Stamping or white painting	End face
Fish plate	○	—	—	○	—	—	Stamping or relief	Side face or top
Rail brace	○	—	—	○	○	—	Stamping or relief	Side face or top
Base plate Tie plate	○	—	—	—	—	—	Stamping or relief	End face or side face

Notes ⁽⁵⁾ Symbols for the use P: switch, C: crossing and G: guard, but the turnouts of N-type and 60 kg rail purpose are not marked.

⁽⁶⁾ For the filler width, when the widths differ in the both sides, the both widths shall be marked.

⁽⁷⁾ Markings shall be made at an obvious place on the indicated surface.

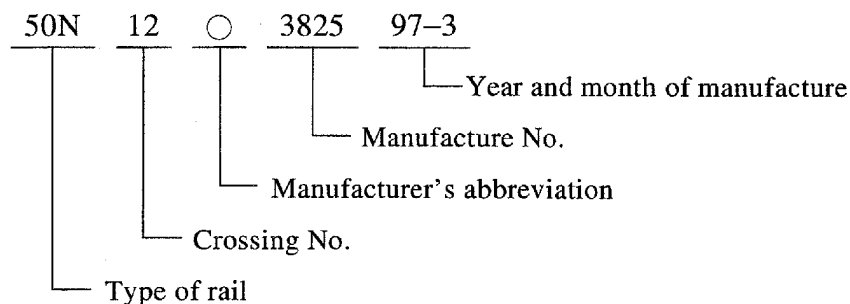
12.2 Marking on pressure welded crossing and NEW crossing For a pressure welded crossing and NEW crossing, a name plate clearly indicating the following information shall be attached on the wing rail at the web.

- a) Type of rail
- b) Crossing number
- c) Manufacturer's name or abbreviation
- d) Manufacturing number, year and month of manufacture

12.3 Marking on solid manganese steel rigid crossing Solid manganese steel rigid crossings shall be marked with the following information in relief on the web surface or other suitable position. Among them, the year of manufacture shall be stated in the last two figures of the Christian Era.

- a) Type of rail
- b) Crossing number
- c) Manufacturer's name or abbreviation
- d) Manufacture number and year and month of manufacture

Example: In the case of solid manganese steel rigid crossing to be used for No. 12 simple turnout of 50 kgN rail.

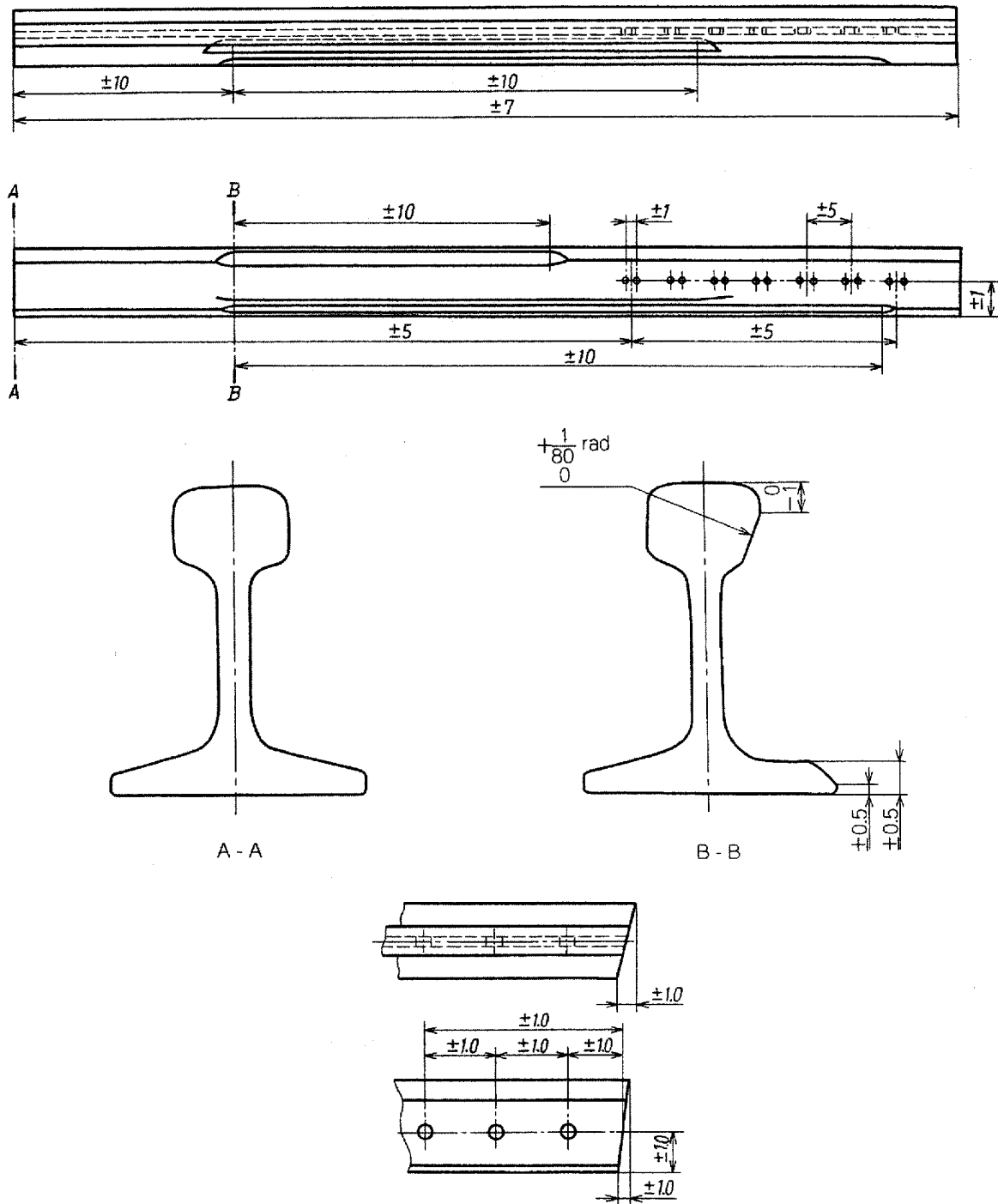


Attached Table 1 Normative references

JIS B 0601	<i>Geometrical Product Specification (GPS)—Surface texture : Profile method—Terms, definitions and surface texture parameters</i>
JIS B 0659	<i>Roughness comparison specimens</i>
JIS B 1180	<i>Hexagon head bolts and hexagon head screws</i>
JIS B 1181	<i>Hexagon nuts and hexagon thin nuts</i>
JIS B 1214	<i>Hot headed rivets</i>
JIS B 1251	<i>Spring lock washers</i>
JIS B 1351	<i>Split pins</i>
JIS E 1101	<i>Flat bottom railway rails and special rails for switches and crossings of non-treated steel</i>
JIS E 1107	<i>Steel bolts and nuts for fish-plates and fastenings</i>
JIS E 1115	<i>Spring washers for fish plates</i>
JIS E 1120	<i>Head hardened rails</i>
JIS E 1304	<i>Geometry of turnouts and crossings</i>
JIS E 1305	<i>Railway switches—Shapes and dimensions</i>
JIS E 1306	<i>Railway crossings—Shape and dimensions</i>
JIS E 1307	<i>Guards for turnouts and crossings—Shapes and dimensions</i>
JIS E 1311	<i>Railway—Turnouts and crossings—Vocabulary</i>
JIS G 0559	<i>Methods of measuring case depth for steel hardened by flame or induction hardening process</i>
JIS G 0565	<i>Method for magnetic particle testing of ferromagnetic materials and classification of magnetic particle indication</i>
JIS G 3101	<i>Rolled steels for general structure</i>
JIS G 3104	<i>Steel bars for rivet</i>
JIS G 3106	<i>Rolled steels for welded structure</i>
JIS G 3505	<i>Low carbon steel wire rods</i>
JIS G 4051	<i>Carbon steels for machine structure use</i>
JIS G 4401	<i>Carbon tool steels</i>
JIS G 4801	<i>Spring steels</i>
JIS G 5101	<i>Carbon steel castings</i>
JIS G 5131	<i>High manganese steel castings</i>
JIS G 5501	<i>Grey iron castings</i>
JIS G 5502	<i>Spheroidal graphite iron castings</i>
JIS K 2220	<i>Lubricating grease</i>
JIS K 2439	<i>Creosote oil • Prepared tar • Tar pitch</i>

- JIS K 5421 *Boiled oil and boiled linseed oil*
- JIS K 5531 *Nitrocellulose lacquer*
- JIS Z 2244 *Vickers hardness test—Test method*
- JIS Z 2246 *Shore hardness test—Test method*
- JIS Z 2343-1 *Non-destructive testing—Penetrant testing—Part 1 : General principles—Method for liquid penetrant testing and classification of the penetrant indication*
- JIS Z 2343-2 *Non-destructive testing—Penetrant testing—Part 2 : Testing of penetrant materials*
- JIS Z 2343-3 *Non-destructive testing—Penetrant testing—Part 3 : Reference test blocks*
- JIS Z 2343-4 *Non-destructive testing—Penetrant testing—Part 4 : Equipment*
- JIS Z 3060 *Method of ultrasonic examination for welds of ferritic steel*
- JIS Z 3212 *Covered electrodes for high tensile strength steel*

Unit: mm



Toe and heel of stock rail with joint holes (if drilling)

Attached Fig. 1 Stock rail and knuckle rail