

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)**



सत्यमेव जयते

**INDIAN RAILWAY
STANDARD SPECIFICATION**

FOR

**FABRICATED OVER-RIDING SWITCHES,
WELDED/HEAT TREATED CROSSINGS,
THICK WEB SWITCHES (TWS), THICK WEB SWITCH-
EXPANSION JOINTS (TWSEJ), IMPROVED SWITCH-
EXPANSION JOINTS (ISEJ) AND
SWITCH EXPANSION JOINTS (SEJ)**

Serial No. IRS: T-10-2025

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0. FOREWORD

- 0.1** This specification issued under the fixed serial No.T10; the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision.

ADOPTED 1934

REVISED 1937, 1947, 1951, 1954, 1956, 1959, 1962, 1968, 1997, 2000, 2023 & 2025

- 0.2** This specification was revised in 2023 to incorporate the requirements of corrigenda issued so far, to include the latest developments in the field of points & crossings, Thick web switch, Thick web switch expansion Joints and Switch Expansion Joints to specify the materials as per IS specifications and to fall in line with Indian Standard practice to the extent possible. This specification has now been revised to incorporate the latest version of referred IS/IRS codes, corrigendum issued & to specify the quality of raw material for various components. To incorporate stencil of Thick web switch & Thick web switch expansion Joints.
- 0.3** All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-7.1-11 dated 19.07.2016 (titled "vendor-changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

1. SCOPE

- 1.1** This specification covers the requirements of built up portions of switches and crossings for use in turnouts, diamond crossings, cross-overs, asymmetrical/symmetrical thick web switches, Thick Web Switch Expansion Joints, crane rail switches, switch expansion joints, Improved switch expansion joints and welded/heat treated (head hardened) crossings & switches etc.

1.2 REFERENCE SPECIFICATIONS

The following specifications have been referred to in this specification

IS: SPECIFICATION	IRS: SPECIFICATION
IS: 77-1976 (Reaffirmed Year: 2024)	IRS: T.12-2009
IS:104-2017 (Reaffirmed Year:2022)	IRS: T.13-1966
IS:13607-1992 (Reaffirmed Year:2019)	IRS: T.23- 2021
IS: 210-2009 (Reaffirmed Year: 2020)	IRS: T.42-2020
IS:817-1966 (Reaffirmed Year:2019)	IRS: P.31-1971
IS:1148-2009 (Reaffirmed Year: 2021)	IRS: T-16-2019
IS:1153-2000 (Reaffirmed Year: 2021)	IRS: T-62-2025
IS:1875-1992 (Reaffirmed Year: 2021)	
IS:2016-1967 (Reaffirmed Year: 2021)	
IS:2062-2011 (Reaffirmed Year: 2021)	
IS: 2074 (Part-1)-2015 (Reaffirmed Year: 2020)	
IS:2875-1993 (Reaffirmed Year: 2019)	
IS:3063-1994 (Reaffirmed Year: 2021)	
IS:3073-1967 (Reaffirmed Year: 2021)	
IS:4072-1975 (Reaffirmed Year: 2022)	
IS:7310: Part 1:2019 (Reaffirmed Year: 2023)	

Note: The year of various specifications under reference given herein is the prevailing version at the time of issue of this specification. However, whenever any reference specification is revised, its latest revision will be followed.

2. TEMPLATES

- 2.1** The contractor shall prepare two sets of templates of approved metal for each type of switches and crossings and switch expansion joints ordered and quality assurance programme and shall submit them for approval to the purchaser or RDSO and shall obtain his approval before commencing the manufacture of built up portions of switches and crossings and switch expansion joints. For heat treated/welded crossing, the manufacturer shall submit separate quality assurance programme to the Purchaser or the Inspecting Officer for approval. The thickness of machined head of symmetrical/asymmetrical thick- web tongue rails shall be checked with the help of gauges/ templates at different locations as shown in the drawing. These gauges/templates shall be made in two parts with reference to web of thick web rails.

3. MANUFACTURE

3.1 MATERIAL

- 3.1.1** The rails shall normally be provided by the purchaser and delivered free at the contractor's works. If, however, the contractor is required to provide these rails, they shall be in accordance with IRS specification No.T-12- 2009 (latest revision) (Flat bottom railway rails) and of class of steel specified by the purchaser to manufacture switches & crossings and switch expansion joints.

The Thick-Web Asymmetric Zu-1-60/60E1A1 & ZU-2-49/49E1A1 rails, to be used for manufacture of Thick-web switches/ Thick Web Switch Expansion Joints, shall conform to the requirements of IRS Specification No. T-12-2009 (latest revision) and shall be of class of steel as specified by the purchaser. The end forging of the Thick-web Asymmetric rails shall conform to the "Specification for end forging of Thick-web asymmetrical rails IRS No. T-62-2025".

Rails used in the manufacture of switches & crossings and switch expansion joints shall be visually examined for absence of surface defects like cracks, seams, lap, pipes & sulphur segregation etc. before subjecting them to ultrasonic test for detection of internal flaws. Rails having deep corrosion, pittings, especially at the foot shall not be used for fabricating switches, crossings and SEJs. Rails having surface defects or internal defects are to be completely discarded or eliminated. The procedure for ultrasonic tests shall be as per the standard method issued by RDSO. All cold bending should be done by suitable hydraulically operated machine with loading rollers/mandrels having adequate (generous) radius so that point-loading is avoided in order to eliminate breakage of Gr.880/R-260 rails. Normally, no hot working on Gr.880/R-260 rails is permitted. However, in extreme cold conditions, for ease of fabrication/bending of rails following methods of heating may be employed if necessary:-

- i) Immersing the rail in boiling water or sprinkling it on rail.
- ii) Putting the rails in open sunlight for some time.

Note:

1. Both the Gr.880/R-260 and head-hardened rails are very susceptible to crack on application of heat and as such use of Oxy-Acetylene or any other flame/heating device should not be made to do any kind of cutting, drilling, bending etc. of these rails.
2. For handling, stacking and maintenance of rails, provisions of IRPWM August '2024 would be applicable in addition to the handling and stacking recommendations as provided in Document No. CT-35 of RDSO. These Provisions and guidelines shall apply to 90 UTS, 1080 HH, R 260 & R350 HT rails.
3. The machining smoothness specially for SEJ at foot-cut and other places may be quantified to three triangles as per IS: 3073 including avoiding pop marking on rails. Instead marking may be made by scribe on chalked area.

The accepted rails after Ultrasonic Test shall be stamped by the inspecting official at both ends of the rail head-sides (100 mm inside from the end section).

- 3.1.2** Switch stops, fang bolts and spherical washers shall be made from steel conforming to IS: 2062, Gr. E250 Quality BR*/B0 (structural steel-Standard quality).
- 3.1.3** The heel, distance, throat, nose, check rail blocks and slide blocks shall conform to gray cast iron FG 200 of IS:210 - 2009 (Reaffirmed Year:2020). (Gray iron castings) with blocks, having as cast' part nos., month/year of manufacture & firms insignia on them.
- 3.1.4** Single coil spring washer shall conform to IRST: 42- 2020.

- 3.1.5** The bearing plates, slide chairs and tie plates shall conform to the requirement of Gr. E250 Quality BR*/B0 to IS: 2062 - 2011 (Reaffirmed Year: 2021).
- 3.1.6** Track bolts and nuts shall conforming to IRS specification No.T.23-2021 (Track bolts and nuts).The fang bolts and nuts shall conform to IRS specification No.T13-66 (Fang bolts).The plate screws shall conform to IRS Specification No. T: 16-2019.
- 3.1.7** The rivets for slide chairs shall conform to IS: 1148 - 2009 (Reaffirmed Year: 2021) (Rivet bars for structural purpose).
- 3.1.8** The spring washers shall conform to IS: 3063 -1994 (Reaffirmed Year: 2021) (Spring washers for bolts, nuts and screws) with material designated as 55 Si 7 to IS: 4072/75 (Reaffirmed Year: 2022), Grade7.
- 3.1.9** Ordinary washers shall conform to IS: 2016 - 1967 (Reaffirmed Year: 2021) (Plain washers) having material to Gr. E250 Quality BR*/B0 of IS: 2062 - 2011 (Reaffirmed Year: 2021).

*BR Quality to be used, if there is no mutual agreement between manufacturer & purchaser for Charpy Impact test else B0 Quality can be used in lieu of BR Quality.

Note:

Latest revision of various specifications as prevalent in July, 2024 have been shown. However, if any specification is subsequently revised, then provisions of the latest revised edition shall be followed.

3.2 TESTING OF MATERIAL

3.2.1 Imported Material

Where sanction has been obtained specially to import material or components, such material or components shall be inspected and passed in the country of origin before being dispatched to India, if this is desired by the contractor. In such cases, the contractor shall submit to the purchaser or the Inspecting Officer details (on form I.S.D. 1-32 No.49 in quadruplicate) of the materials or components to be inspected, together with the requisite number of copies of all necessary documents to enable inspection to be carried out prior to dispatch. The cost of such inspection and supervision of tests in this connection will be borne by the purchaser, the contractor providing free of charge all material, labour and appliance for carrying out tests made in his works and any material which may be required for independent tests and analysis elsewhere.

3.2.2 Indigenous Material

In case of material produced in India, identifiable test certificates issued by the metallurgical Inspector, DGS & D or any other authority as approved by the purchaser showing that the relative specification has been complied with, will be accepted.

3.2.3 Uninspected Material

Where the material to be used in fabrication is from the contractor's stock, the Purchaser or the Inspecting Officer shall be empowered to call for a duly authenticated series of tests and analysis to be obtained from the maker for each cast and section of materials

used in the work and to accept the same in lieu of other tests to the extent he deems fit. The cost of any confirmatory tests, which result in rejection of the material, shall be borne by the contractor. There shall be no appeal on the result of the tests or analysis made by the Metallurgical Inspector of DGS & D or the Director of Government Test House, DGS & D Department or any other authority as approved by the indenter. In case, the material is not supported by maker's or other certificates of quality, it shall be open to the Purchaser or the Inspecting Officer either to reject it or to make or have made such tests as may be considered necessary to establish its compliance with the specification. In case, the material does not conform to the specification, the lot shall be rejected. Proof of proper disposal of such rejected material shall be maintained properly by the manufacturer. The cost of all such tests and analysis, whether at contractors works or elsewhere, shall be borne by the contractor.

3.3 Manufacturing practices

- 3.3.1** All rails shall be carefully machined, drilled or cut to the dimensions shown on the drawings. Rails used in the manufacture of switches and crossings and switch expansion joints shall be ultrasonically tested to eliminate all defective rails. Rails shall be bent accurately as specified without any injury to the material. The rails after bending shall be tested by magnetic particle test and shall be free from cracks. The rails shall be bent cold. No drilling and cutting by hand shall be permitted. Hand filing and chipping shall only be allowed where machining cannot be done. The portion where the splice rail fits into the point rail, shall be milled. In case of SEJ, the portion where the tongue rail matches with the stock rail shall be milled. The clearance between nose and wing rails of the crossing and also between the check rail and running rail shall not be less than the dimensions shown on the drawings and shall not exceed those by more than 1.00mm. The clearance between MS bracket and tongue rails/stock rails of the SEJ shall not be less than the dimensions shown on the drawing. The contractor shall not be required to supply fish bolts or fish plates for connecting the switches and crossings with the main line but the rails shall be drilled for fish bolts to the standard drilling gauges. Welding shall not be employed under any circumstances without prior written permission of the purchaser or the Inspecting Officer.
- 3.3.2** Holes in point, splice, wing, check, tongue, stock rails etc. shall be drilled with approved drilling jigs with hardened bushes so that accuracy of the hole diameter and the relative position of the holes can be strictly maintained as per drawing/specification. All jigs shall be checked in detail periodically to ensure their accuracy.
- 3.3.3** The correctness of hole spacings shall be checked with a single template made specifically for this purpose by the manufacturer and duly checked and stamped by the purchaser/Inspecting Officer. All rails shall have their ends sawn or machined to the dimensions shown on the drawing and burrs, if any, shall be removed. The deviation from squareness shall not exceed 0.2 mm in both the axis.
- 3.3.4** All the holes for fish bolts shall be chamfered with a standard chamfering tool. The drilling of fish bolt holes shall be done within a tolerance of ± 0.6 mm in location and in diameter.

4 TOLERANCES

4.1 SWITCHES

4.1.1 Stock Rails

The holes in the web of stock rails shall register with reference to the base of the rail and to the toe end of rail within ± 0.8 mm provided that the fish bolt holes shall register within ± 0.6 mm tolerance with the ends of the rail. If any rolling marks on web of the stock rail comes within the region of the tie plate or under a switch stop, it shall be ground or chipped off to ensure correct gauge. The length of rail may be 3 mm longer or shorter than shown on the drawings or as per tolerances of IRS: T 12-2009 (latest revision), wherever full rail length of stock rail is provided in the drawing.

4.1.2 Switch Rails

The holes in the switch rails shall register with reference to the base of the rail and centre of heel block with ± 0.8 mm provided that the fish bolt hole shall register within ± 0.6 mm tolerance with the fishing end of the rail. The length of switch rails shall be correct within ± 3 mm when measured from the heel. The bend of the rail shall be correct, the inner face straight and the planing correct within ± 0.1 mm, when tested with profile gauges which shall engage the whole rail at specified locations shown on the drawings. The inside of the foot of the rail at toe shall be filed or ground off to a radius of 10 mm. This is not shown on the drawings.

4.1.3 Maximum clearance between switch and stock rails in assembled position:

4.1.3.1	Between inner head	:	0.5 mm
4.1.3.2	Between over-riding surfaces at the toe end and at the heel end and at the heel	:	0.5 mm
4.1.3.3	Between over-riding surfaces at the center	:	1.5 mm

4.1.4 Switch stops

Horizontal distance between hole and height of stop shall be correct within ± 0.8 mm. Tolerances to other dimensions are not important. The ends of straps may be left sheared, provided the surface which is to bear against the web of rail is flat.

4.1.5 Tie plate for switches

The lugs/MS shoulder at the ends of the tie plate for Over-riding/Thick web switches shall be parallel to one another and at right angles to the centre line of the plate. The distance between their inner faces shall be correct within ± 0.8 mm of the dimensions shown on the drawings. The lugs/MS shoulder shall be riveted after being welded to the tie plates. The tie plates to be used on concrete sleepers, shall have the holes registered within ± 0.8 mm in the longitudinal direction as well as in the cross direction. The ends of plates may be left sheared, provided the cut is clean and plate lies flat.

4.1.6 Heel blocks

When the heel block is bolted up tightly between two standard rails, the heel divergence i.e. the offset to be measured between the gauge faces of stock & tongue rails shall be exact as given in the drawing. Blocks shall be in contact with the web of the rails throughout. Holes shall register with reference to each other and to the centre and cross lines shown, and to the ends of blocks within ± 1.5 mm. The diameter of holes may vary by ± 1.5 mm from the diameter shown on the drawings.

4.1.7 Fang Bolts/Plate screws

The length of the screwed portion of fang bolts/plate screws shall not be less than that shown on the drawings.

4.2 CROSSING

4.2.1 Splice Rails

The length of splice rails may vary by ± 3 mm from that shown on the drawings. The holes in the rail shall register with reference to the base and to the nose end of the rail within ± 0.8 mm. The exceptions are:

- a) The holes for turned bolts drilled after assembly.
- b) The fish bolt holes, which shall register within ± 0.6 mm with reference to fishing end of the rail.

To avoid the sharp corners that may be left where the head and foot of splice rail are cut away to join the point rail, a 6mm diameter sunken fillet following the curve of the rail head and foot shall be filed or cut at the top and bottom of the projecting web of splice rail as shown on the drawings.

4.2.2 Point Rails

The length of point rails may vary by ± 3 mm from that shown on the drawings. The holes in the rails shall register with reference to the base and to the nose end of the rail within ± 0.8 mm. Where point rail is cut away to house the splice rail, the corner radius shall run into the planing of head and foot with perfect smoothness. The point and splice rails assembly should be such as not to allow any relative movement between them and when checked in assembled position, should not permit the insertion of 0.05 mm feeler gauge between the mating surfaces of point and splice rails.

4.2.3 Wing Rails

The horizontal bends in wing rails shall be correct within ± 1.5 mm of the offset shown on the drawings. The machining tolerance in head of machined head wing rails shall be within ± 0.5 mm and in foot within ± 1 mm. The holes shall register with reference to the foot of the rail within ± 0.8 mm and with reference to the fishing end of the rail within ± 3 mm.

4.2.4 Check Rails

The planed foot of the check rails shall be straight and spaced relative to the gauge line of the head within ± 1.0 mm of the dimensions shown on the drawings. The length of the check rails shall be correct within ± 5.0 mm of the dimensions shown on the drawing. The machining tolerance in head shall be within ± 0.5 mm & in foot within ± 1.0 mm. The holes

in the web shall register with reference to foot of the rail and each other horizontally within ± 0.8 mm.

4.2.5 Tie Plates for Crossings

The tie plates to be used for crossings, shall have the holes registered within ± 0.8 mm in the longitudinal direction as well as in the cross direction with holes in a template accurately made to the dimensions given on the drawings. The ends of plates may be left sheared, provided the cut is clean and plate lies flat.

4.2.6 Throat Block

As long as the throat blocks conforms to the drawings within ± 0.8 mm in respect of width, curvature and depth, it is immaterial if the block is slightly shorter or longer than shown on the drawings. The holes shall register with reference to each other and to the centre and cross lines shown within ± 1.5 mm. The diameter of holes may vary by ± 1.5 mm from those shown on the drawings.

4.3 WELDED-HEAT-TREATED CROSSINGS

4.3.1 A welded-heat treated crossing may be defined as an assembly having composite welded 'V' to avoid separate point and splice joints in order to increase the rigidity and the strength of the 'V' portion. The welded length in this design shall be about 1500 mm from ANC, while the wing rail shall be of "Heat Treated" (Head Hardened) quality of higher strength and hardness than usual rails. The length of the heat treated (hardened) portion may be limited to about 400 mm on either side of ANC or full length of wing rails.

4.3.2 The supply of welded-heat treated crossings can be made in the following categories:

- (i) Welded-cum-head hardened crossings having welded 'V' (welded length being about 1500 mm from ANC) with head hardened wing rails (hardened length being 400 mm on either side of ANC).
- (ii) Head hardened crossing having both 'V' and wing rails being of head hardened (heat treated) quality and also having point/splice joint in the 'V' portion
- (iii) Welded crossings having welded 'V' (welded length being about 1500 mm from ANC) with wing rails of normal quality i.e. Gr. 880 of IRS: T-12 - 2009.

Note:

In the above mentioned categories, full length of wing rails may be fabricated from head-hardened rail (as per IRS/T-12-2009) with specific prior approval of the purchaser.

4.3.3 The hardness values and range, cross sectional dimensions of weld for both rail head and foot and depth of hardening for both welded as well as head hardened (heat-treated) locations shall be as given below:

(a) For welded crossing

Weld metal hardness at the top of head surface as well as in cross-section shall be in the range of 330 ± 20 BHN with a weld metal depth of 20 mm min. The hardness value of weld metal at the rail foot shall not be less than the hardness of the parent rail.

(b) For Heat treated Crossing/Switches

The heat treated (Head hardened) rail hardness at top surface of rail head shall be 330 BHN within a tolerance of ± 20 BHN. The hardness at a depth of 12.0 mm from the top surface of head at midsection of rail face will be in the range of 290-310 BHN and 260-280 BHN at the depth of 15.0 mm. The variation of hardness from top surface upto a depth of 15.0 mm shall be gradual. Sudden variation in hardness of more than 20 BHN/mm shall not be allowed as measured at every 3 mm. Nature of test: Fig. 8 at clause 19.2.3 of IRS-T-12-2009 (Latest revision). The test shall be performed in accordance with IS: 1500 (Part-I)-2019

4.3.4 Crossings to be fabricated by welding shall be welded with any of the following automatic welding process:

(a) Electro-slag process.

(b) Any other automatic process suitable for rail steel welding with prior approval of RDSO.

There shall be no start/re-start points in the weld-seam. The manufacturer shall engage qualified welder for manufacturing such weld-fabricated crossings and the welder must comply with following:

- He has attended an approved training course.
- He holds a valid appropriate authorisation of competency as specified in IS:7310 (Part-I):2019 (Reaffirmed Year: 2023) or IS:817: 1966 (Reaffirmed Year:2019).
- He is subjected to re-training at specified intervals.

Weld consumables: All weld consumables to be used in the particular welding process are to be approved by RDSO before they are permitted to be used. In case of any change in the approved consumables intended by the manufacturer during execution of a particular contract, the same shall be brought to the notice of RDSO for fresh approval.

4.3.5 For fabrication of heat treated (Head Hardened) crossings and switches, Gr.880/R260 rails to IRS:T-12/2009 shall be subjected to heat treatment following the method of 'Induction' hardening and subsequent cooling/tempering etc. or any other suitable method with prior approval of the purchaser. For fabrication of heat treated (head hardened) crossings ('V' portion or wing rails) and switches, Gr.1080 rails & R350 HT to IRS:T-12-2009 may also be used.

4.3.6 (a) The welded rails and heat treated rails to be used in the regular fabrication of crossings and switches shall have an extended length of 75 mm (min.) than the specified length. These extended length will be cut for subjecting them to various tests required for ensuring various properties and soundness, e.g., ultrasonic testing, surface hardness, depth of weld metal and heat treatment, fusion character etc. for the purpose of acceptance.

(b) For the purpose of approval of the processes of welding build-up and heat treatment methods, additional tests like tensile strength test, yield strength, elongation percentage, impact tests and macro & micro structural tests will be done in addition to tests at (a) above.

For easy identification of heat treated rails used in fabrication of switches, wing rails and/or 'Vee' of the crossing, both webs at the end of switches and crossings making use of head hardened (heat treated) rails shall be provided with a painted strip of deep blue colour on web portion for a length of 500 mm from the ends. Accordingly, the painting provisions as mentioned at clause 8.2 and 8.3 shall not be applicable only for two webs for 500 mm length from the ends in case of heat treated switches, crossings.

Note:

To ensure that the parts of the crossing are correctly formed and are not forced into place, the bends in the wing rails shall be tested before assembly. All crossings should be inspected when assembled with the last distance block towards each end quite loose. In this condition the dimensions between the heads of the rails at each end of the crossing shall be correct within a plus tolerance of 3 mm of the dimensions shown on the drawing. The position and width of two end distance blocks should be checked at the same time. Attention is drawn to the instructions on the drawing, to the effect that the holes for turned bolts connecting splice and point rails are to be drilled or reamed to full size after assembly. The overall length of the crossing may vary by ± 3 mm from that shown on the drawing.

- 4.3.7** The firm shall adopt such welding and or heat treatment technique so as to achieve minimum tensile and elongation properties equivalent to rails used for fabrication of welded "V"

4.4 Switch Expansion Joints (SEJ), Improved Switch Expansion Joints (ISEJ) & Thick Web Switch Expansion Joints (TWSEJ),

4.4.1 Stock rails for SEJ/ISEJ/TWSEJ

The length of the rail may be ± 3 mm longer or shorter than shown on the drawings or as per the tolerance of IRS/T-12-2009 wherever full rail length of stock rail is provided in the drawing.

4.4.2 Tongue rails for SEJ / ISEJ/TWSEJ

The length of the tongue rail shall be correct within ± 3 mm tolerance. The bend of the rail shall be correct and the planing correct within ± 0.1 mm when tested with profile gauges.

- 4.4.3** The clearance between the mating surface of stock & tongue rails of SEJ / ISEJ/TWSEJ shall not exceed 0.5 mm.

4.5 GENERAL

4.5.1 Spherical Washers

Washers may be machined from bar or forged, Spherical surface shall be machine-finished to correct radius. The diameter of holes may be 1.0 mm greater than shown on the drawings. The other dimensions are not important but outer diameter of the upper washer shall not be less than that shown on the drawings. When spherical washers are drop stamped and drilled, spherical surface need not be machined, provided they are reasonably smooth.

4.5.2 Bearing Plates

The bearing plates to be used on concrete sleepers, shall have the holes registered within ± 0.8 mm in the longitudinal direction as well as in the cross direction with holes in a template accurately made to the dimensions given on the drawings.

4.5.3 Distance Blocks

Provided that the distance block conform to the drawings within ± 0.8 mm in respect to the width, taper and depth, except in the case of nose and slide blocks in which it fits between their machined surfaces and corresponding portions of rails, will be as specified in the relevant drawings. It is immaterial, if the block is slightly shorter or longer than shown on the drawings. The holes shall register with reference to each other, and to the centre and cross lines shown, within ± 1.5 mm. The diameter of holes may vary by ± 1.5 mm from the diameter shown on the drawings.

4.5.4 Slide Chairs/CI chairs

For slide chairs to be used on concrete sleepers, the holes shall be equidistant from the centre line of the slide chairs within a tolerance of ± 0.8 mm. The position of holes may vary from the positions shown in the drawing by ± 0.8 mm in both the vertical and horizontal directions.

The front edge of the chair may be left sheared provided the cut is reasonably clean and of the chair is flat. The height of pressed up table for tongue rail seating shall be correct within ± 0.4 mm of the dimension shown on the drawings.

MS Bracket: For CI chairs to be used on concrete sleepers, the back edges of MS bracket as shown on the drawing shall be machined.

4.5.5 Black Bolts

Unless otherwise shown on the drawings, the screwed portion of black bolts shall not be less than 75 mm in length.

4.5.6 Turned Bolt

The shank of the turned bolts shall be machined within ± 0.125 mm and holes reamed to give a driving fit.

4.5.7 Cast steel slide chair / Tie plate / Bearing plate

Cast steel slide chair / Tie plate / Bearing plate shall conform to Grade 280-520 W of IS: 1030:1998 (Reaffirmed 2022). Cast steel slide chair / Tie plate / Bearing plate shall be checked for dimensions as per drawings.

Maximum surface roughness of machined area and Non-machined area of Cast steel slide chair / Tie plate / Bearing plate are 6.3 micron and 25 micron respectively.

4.5.8 Anti Creep Device

Anti Creep Device shall conform to Grade SG 500/7 of IS: 1865-1991. ACD shall be checked for dimensions as per drawings.

5 SAMPLES

- 5.1 One crossing of each angle and one set of each type of switch and one set of each type of SEJ shall be approved as samples by the purchaser or the Inspecting Officer before the remainder of work is proceeded with. The remainder of work is to be strictly in accordance with each approved sample and equal thereto in quality, workmanship, dimensions and all other fabrication aspects.

6 MARKING

- 6.1 All component parts of the switches and crossings and switch expansion joints shall be marked with the maker's initials/mark and IRS part number shown on the drawings either stamped or cast thereon. When the size of component part permits, the letters and figures of stamped markings shall be not less than 25 mm in height and 1.5 mm depth.
- 6.2 The serial number of each switch/crossing/SEJ shall be punch marked with 10 mm high and 0.5 mm deep letters vertically on the web of the rails to identify the switch/crossing/SEJ. The punch mark will have 6 digits. The first three digits shall be the Zonal Railway's contract number and the last three digits indicating the serial number of switch/crossing/SEJ.

The punching of six digit Serial Number on switches shall be done at heel end of stock and tongue rail whereas on crossing, at one of the wing rails at heel end. On SEJ the punching of six digits Serial Number shall be made on machined end of stock rail and rear end of tongue rails. Three/Four digits/letters shall be punch marked at foot below Serial Number indicating initial of the firm in 5 mm size letter punch.

In addition, marking on end faces of head of switches, SEJ and crossings shall be as per paras 6.2.1, 6.2.2 & 6.2.3 respectively. Pasting of galvanized/Aluminium strip and stenciling on web faces shall also be done as per paras 6.2.4 and 6.2.5 respectively.

- 6.2.1 The manufacturer shall mark the rail ends of switches with deep, distinct punch marks 10 mm high with the following letters/numerals in the sequence 'ST' or 'CR' or SA or CF-D or SF-D to indicate whether straight or curved Over-riding switches or Thick web switches for straight alignment or contrary flexure- degree of main line curve or Similar flexure- degree of main line curve with 'LL' and 'RL' on LH type of switches or 'LR' and 'RR' on RH type of switches. The first letter 'L' or 'R' indicates left or right hand half set switch, whereas second letter 'L' or 'R' indicates whether the switch is meant for LH or RH turnout.

The markings on both end faces of stock rails, and one end face of tongue rails shall be punched as per sketches of annexure-I

- (a) On Over-riding switches meant for LH turnout. [Annexure-I (i)]

On LH side
ST or CR/LL

On RH side
ST or CR/RL

- (b) On Over-riding Switches meant for RH turnout. [Annexure-I (ii)]

On LH side
ST or CR/LR

On RH side
ST or CR/RR

(c) On Thick web switches meant for LH turnout. [Annexure-I (iii)]

On LH side
SA or CF-D or SF-D/LL

On RH side
SA or CF-D or SF-D/RL

(d) On Thick web Switches meant for RH turnout. [Annexure-I (iv)]

On LH side
SA or CF-D or SF-D/LR

On RH side
SA or CF-D or SF-D/RR

(e) On Over-riding Symmetrical split Switches [Annexure-I (v)]

(f) On Thick web Switches Symmetrical split Switches [Annexure-I (vi)]

The letters 'ST' or 'CR' shall sequentially denote straight or curved switches and 'LL' indicate left hand half set switch meant for LH turnout, 'RL' indicate right hand half set switch meant for LH turnout. Similarly 'LR' indicate left hand half set switch meant for RH turnout, 'RR' indicate right hand half set switch meant for RH turnout. Further, The letters SA denote straight alignment, CF-D denotes contrary flexure- degree of main line curve and SF-D, denotes Similar flexure- degree of main line curve.

6.2.2 In respect of SEJ the rail end faces shall be marked with deep and distinct punch mark 10 mm high letters as per sketches of Annexure- II (ii), Annexure-II (iii) & Annexure -II (iv)

(a) On SEJ - On end faces of both stock & tongue rails. as per Annexure-II (ii)

(b) On ISEJ - on end faces of both stock & tongue rails as per Annexure-II (iii)

(c) On TWSEJ - on end faces of both stock & tongue rails. as per Annexure-II (iv)

6.2.3 The marks shall be punched on various components of switches, crossings, SEJ's and at the locations indicated below:

- | | |
|-------------------------|--|
| i) Point & splice rails | - At the heel end face of rails In head portion. |
| ii) Check rails | - At both end faces of rail head. |
| iii) Wing rails | - At the toe end face of rail head. |

6.2.4 In addition to stamping at ends of rails as indicated in clause 6.2.1, 6.2.2 & 6.2.3 above, the distinguishing letters detailed in clause 6.2, 6.2.1, 6.2.2 and 6.2.3 above shall also be stamped in 10 mm high letters on galvanised iron or aluminium sheets or size 80 mm x 30 mm x 1 mm. The sheets shall then be fixed to the webs of rails at the locations indicated below with the help of (a) Araldite XY 27 and hardener XY 28 mixed in the proportion of 100:40 or (b) "M-Seal Asbestos-filled Epoxy compound type 'B' with resin and hardener mixed in the proportion of 100:20 or (c) any other equivalent epoxy resin as approved by the purchaser.. The surfaces of the rail web and galvanised/aluminium sheet shall be cleaned free of all rust, grease or dust with Acetone, Carbon tetra-Chloride, Benzene or Tri-Chloro-Ethylene.

The galvanized/aluminium sheets shall be fixed to the rail webs at the following locations before the rails are given any protective coating as per clause 8:

- (i) **In the case of switches:** At 300 mm (towards toe) from first heel block bolt hole on the open face of tongue rail. As per Annexure-I
- (ii) **In the case of crossings:** At 350 mm from the heel end on the open face of one of the wing rails. As per Annexure-II (i)
- (iii) **In the case of SEJs:** At 400 mm from second bend on stock rails and 400 mm from toe end on tongue rails. As per Annexure-II (ii)
- (iv) **In the case of ISEJs:** At 400 mm from end on stock rails and 400 mm from toe end on tongue rails. As per Annexure-II (iii)
- (v) **In the case of TWSEJ:** At 1000 mm from End forging end on tongue rails and 1000mm from start of stock rail as per Annexure-II (iv)

6.2.5 After final painting of switches, crossings and SEJ's with verdigil green paint the following shall be written on open face of web by stencil of 50 mm size with white paint.

- a) **On Stock rails of Over-riding switches:** As per Annexure-I (i) & Annexure-I (ii)
- b) **On Tongue rails of Over-riding switches:** As per Annexure-I (i) & Annexure-I (ii)
- c) **On Stock rails of Thick web switches:** As per Annexure-I (iii) & Annexure-I (iv)
- d) **On Tongue rails of Thick web switches:** As per annexure-I (iii) & annexure-I (iv)
- e) **On Wing rails of crossing:** As per Annexure-II (i)
- f) **On check rails:** As per Annexure-II (i)
- g) **On Stock and tongue rails of SEJ's :** As per Annexure-II (ii)
- h) **On Stock and tongue rails of ISEJ :** As per Annexure-II (iii)
- i) **On Stock and tongue rails of TWSEJ :** As per annexure-II (iv)
- j) **On Stock rails & Tongue rail of over-riding Symmetrical splits switch:** As per annexure- I (v)
- k) **On Stock rails & Tongue rail of Thick web Symmetrical splits switch:** As per annexure- I (vi)

7 INSPECTION

7.1 The purchaser or the Inspecting Officer shall have free access at all reasonable times to the works, in which switches and crossings and switch expansion joints are manufactured. He shall be at liberty to inspect the manufacturing process at any stage and to reject any materials that do not conform to the terms of this specification.

7.2 The contractor shall supply free of charge the tools and labour required for the inspection at his own premises.

7.3 The Inspecting Officer shall stamp clearly legible passing marks on various components of switches/crossings/SEJ at the locations indicated below:

- | | | |
|------|--------------------------|--|
| i) | Point & splice rails | - At the heel end face of rails in head portion. |
| ii) | Check rails | - At both end faces of rail head. |
| iii) | Wing rail | - At the toe-end face of rail head. |
| iv) | Tongue rails of Switches | - At the heel-end face of rail head. |
| v) | Stock rails of Switches | - At both end faces of rail head. |
| vi) | Stock rails of SEJ | - At the full head end face of stock rails head. |
| vii) | Tongue rails of SEJ | - At the end face of tongue rails head. |

7.4 As the geometry of the Fabricated Switches, Crossings & SEJs is complex at several locations, hence for capturing various dimensional tolerances of the various track components covered in this specification, their critical dimensions can also be measured with the help of electronic methods of measurement like computer-based Coordinate Measuring Machines (CMM) duly calibrated by a reputed lab. The electronic method of measurement should have facility for preservation of the records of measurements.

After the inspecting official is satisfied that the Fabricated Switches, Crossings & SEJs conforms to the relevant drawing and specifications, the same shall be accepted finally and inspection check sheet of the item shall be signed.

8 PROTECTION

8.1 The mating surfaces of point and splice rails and all portions covered by C.I blocks, before assembly shall be thoroughly cleaned to remove all rust, scale, dirt, grease and oil and shall receive primer coats, on each surface to one of the following schedules:

- a) One heavy coat of ready mixed paint red lead, priming IS:104-2017
Or
- b) One coat of ready mixed paint, Zinc Chrome, priming to IS:104-1988 followed by one coat of ready mixed paint; red Oxide Zinc Chrome, priming to IS:2074 (Part-1)-2015
Or
- c) Two coats of ready mixed paint, red Oxide zinc chrome, priming to IS:2074 (Part-1)-2015
Or
- d) Two coats of red oxide zinc chromate primer to IRS specification No.P31-71

Whenever zinc chrome priming to IS:104-2017, red oxide zinc chrome priming to IS:2074 (Part-1)-2015 and red oxide zinc chromate primer to IRS specification Number P31-71 is used as a primer, the above surfaces shall be cleaned properly and free from any dust, rust and oil etc.

- 8.1.1** All crossings and switches after assembly shall be thoroughly cleaned, dried and given one of the priming coats as indicated in clause 8.1, above.
- 8.1.2** The mating surfaces, after application of primer coat as specified in clause 8.1 (a) shall be brought into close contact, while still wet.
- 8.1.3** The mating surfaces, after application of primer coats and finishing paint as specified in clause 8.1 (b), (c) and (d) shall be brought into close contact, after the finishing coat has dried.
- 8.2** All crossings and switches after assembly and after inspection and approval shall be thoroughly cleaned, dried and given primer as indicated in clause 8.1 above. Thereafter, these shall be given one finishing coat of ready mixed paints indicated below:

Rails of 90kg/sq.mm UTS (Grade 880)/R260 & higher grade of rails:

One coat of ready mixed paint verdigil green ISC 280 to IS:13607-1992 (Reaffirmed Year: 2019)

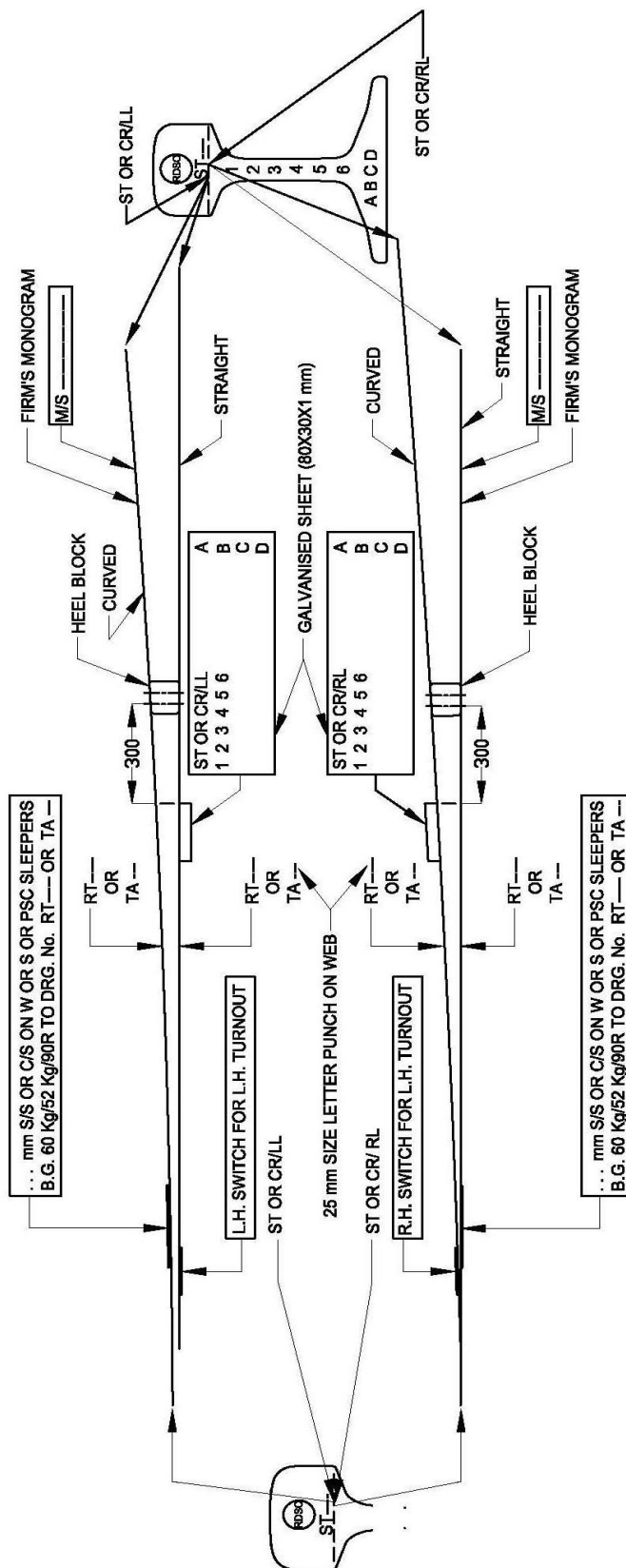
- 8.3** The paint shall be applied by brush/spray. The first priming coat shall be applied within 4 hours after cleaning, etc. The second priming coat shall be applied when the first priming coat has dried. The finishing coat shall be applied when the second priming coat has dried. The dry film thickness of the two coats of primer shall not be less than 40 microns and the complete system inclusive of finishing coat not less than 80 microns.
- 8.4** All slide chairs/CI chairs, bearing plates and other mild steel components shall, after inspection and approval, be dipped cold, into hot boiled linseed oil to IS:77- 1976 (Reaffirmed Year: 2019) or shall be painted with temporary corrosion preventive fluids, hard film, solvent type to IS:1153- 2000 (Reaffirmed Year: 2016) and shall not be packed until the film has dried to an elastic film free from tackiness.

9 PACKING

- 9.1** Each crossing shall be sent complete with all its respective wing rails, point rails, splice rail and cast iron distance blocks bolted in place. The two check rails for each crossing shall be sent with the check blocks bolted on. Bearing plates and slide chairs belonging to one set of switch shall be wired in convenient bundles. The tie plates for crossing and switches shall be wired together. All other parts including special bearing plates required for use beyond the end of crossing point rail or check rails shall be wired in convenient bundles. Each switch rail with switch stops attached, shall be bolted to its respective stock rail with the cast iron heel block bolted in place and the end of switch shall be lashed to the stock with stout wire. If points and crossings are supplied by one contractor and small fittings by another, small fittings shall be bundled in double bags conforming to IS: 2875- 1993 (Reaffirmed Year: 2019) (Jute corn sacks) of suitable size.

- 9.2** Each stock and tongue rail of SEJs shall be sent complete with all of its special cast iron chairs and MS Brackets bolted setwise in assembled condition and the marking shown as in Annexure-II (ii). These sets shall be tied together with stock and tongue rail with stout wires. All other parts including CI chairs and small fittings as shown on part list shall be bundled in double bags conforming to IS: 2875- 1993 (Reaffirmed Year: 2019 (Jute Corn sacks) of suitable size.

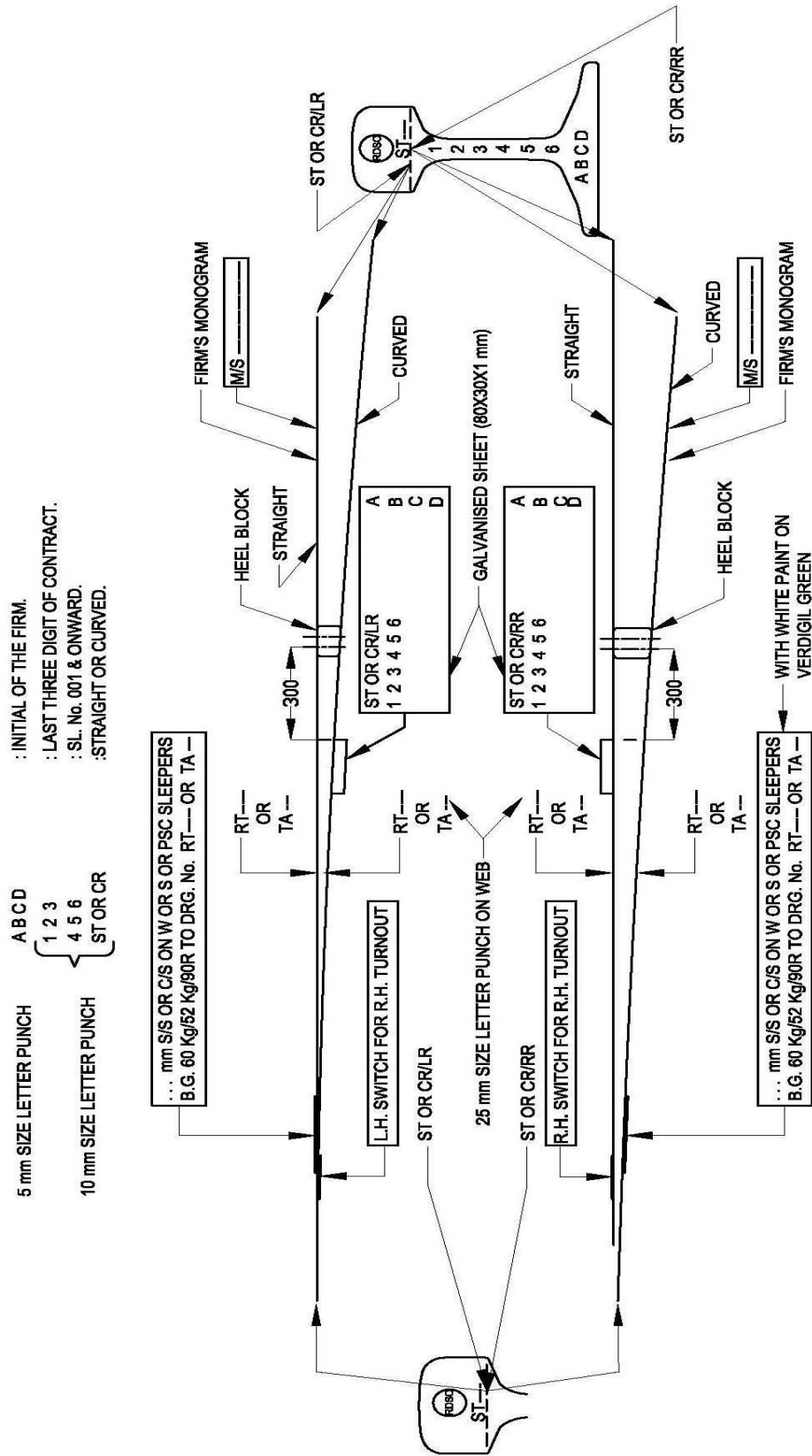
: INITIAL OF THE FIRM.
: LAST THREE DIGIT OF CONTRACT.
: SL. No. 001 & ONWARD.
: STRAIGHT OR CURVED.



SPACE FOR STAMPING SHOWN THUS — O

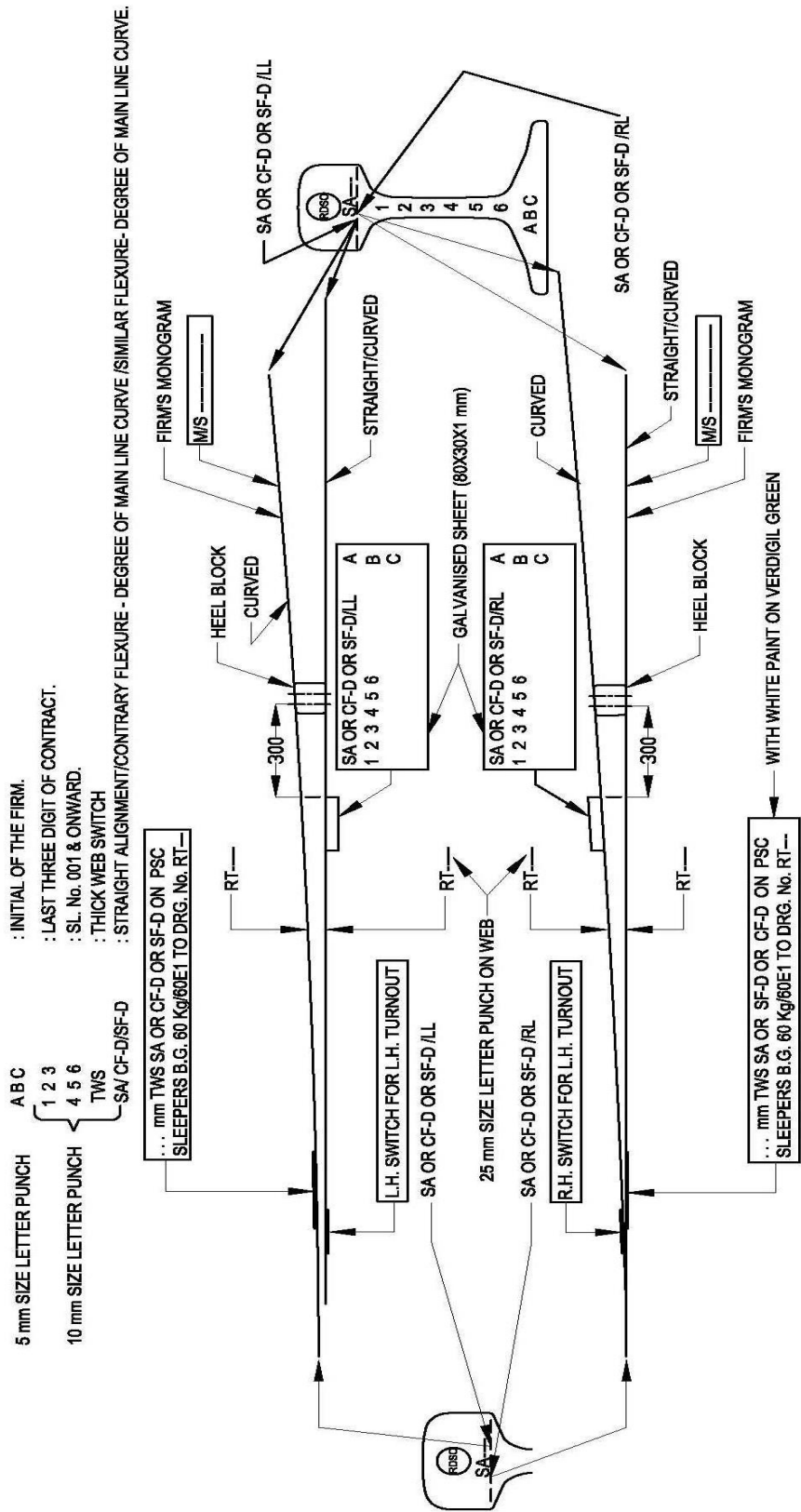
ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE AFTER FINAL VERDIGIL GREEN PAINT.

SAMPLE SKETCH SHOWING PUNCHING AND STENCILING TO BE DONE ON PASSED R.H.SWITCHES DESPATCHED TO CONSIGNEE FOR R.H. SWITCH. TURNOUT



SPACE FOR STAMPING SHOWN THUS — O
ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE AFTER FINAL VERDIGIL GREEN PAINT.

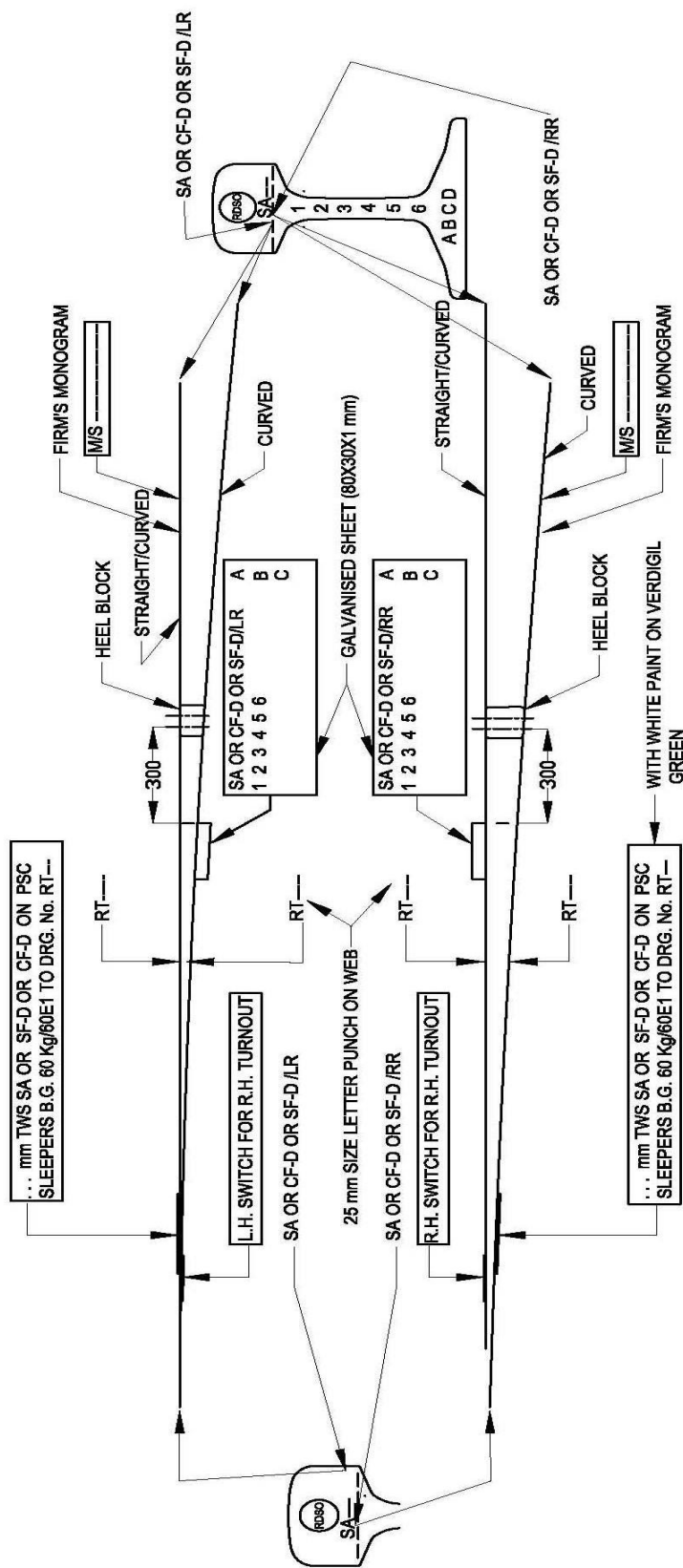
SAMPLE SKETCH SHOWING PUNCHING AND STENCILING TO BE DONE ON PASSED L.H.THICK WEB SWITCHES DESPATCHED TO CONSIGNEE FOR L.H. TURNOUT



SPACE FOR STAMPING SHOWN THUS — O

ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE FOR STOCK RAIL AND 35 mm SIZE FOR THICK WEB TONGUE RAIL AFTER FINAL VERDIGIL GREEN PAINT.

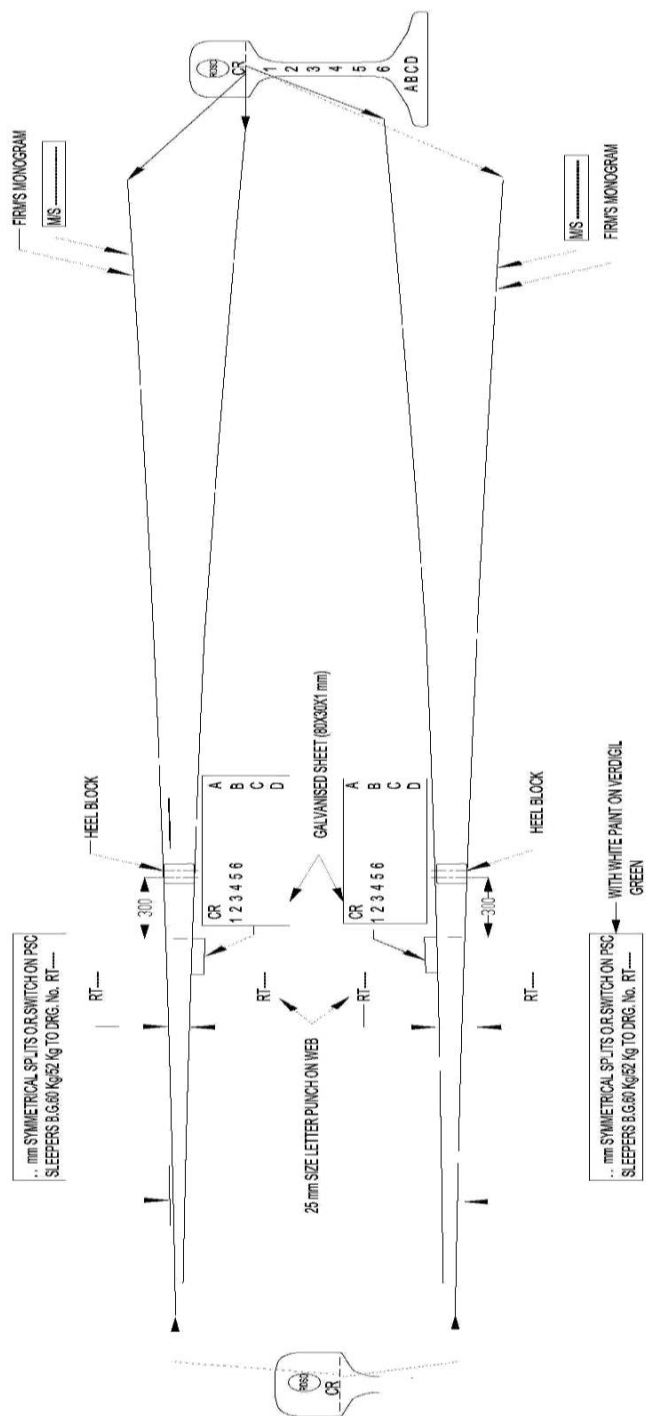
5 mm SIZE LETTER PUNCH A B C
1 2 3
10 mm SIZE LETTER PUNCH 4 5 6
TWS
SA/CF-D/IF-D



SPACE FOR STAMPING SHOWN THUS — 0

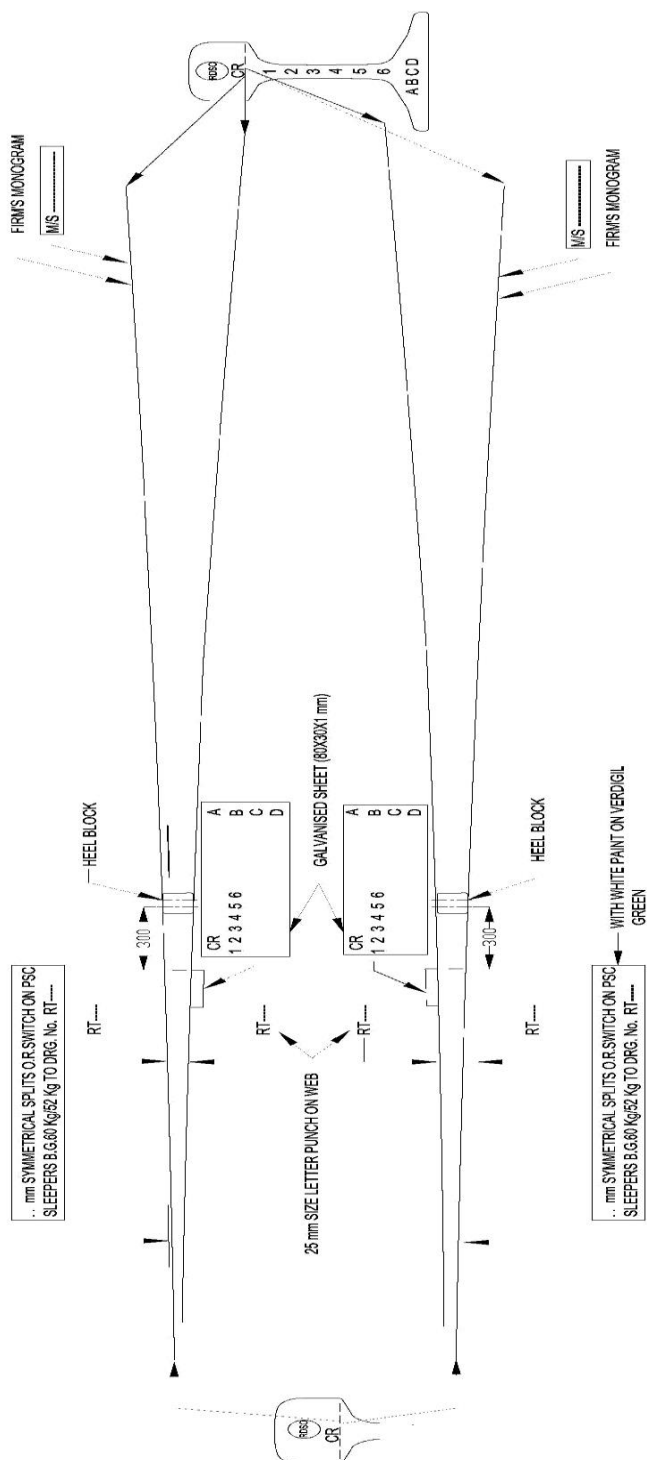
ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE FOR STOCK RAIL AND 35 mm SIZE FOR THICK WEB TONGUE RAIL AFTER FINAL VERDIGIL GREEN PAINT.

5 mm SIZE LETTER PUNCH	A B C D	: INITIAL OF THE FIRM.
	1 2 3	: LAST THREE DIGIT OF CONTRACT.
10 mm SIZE LETTER PUNCH	4 5 6	: SL. No. 001 & ONWARD.
	ST OR CR	: STRAIGHT OR CURVED.



ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE AFTER FINAL VERDIGIL GREEN PAINT.

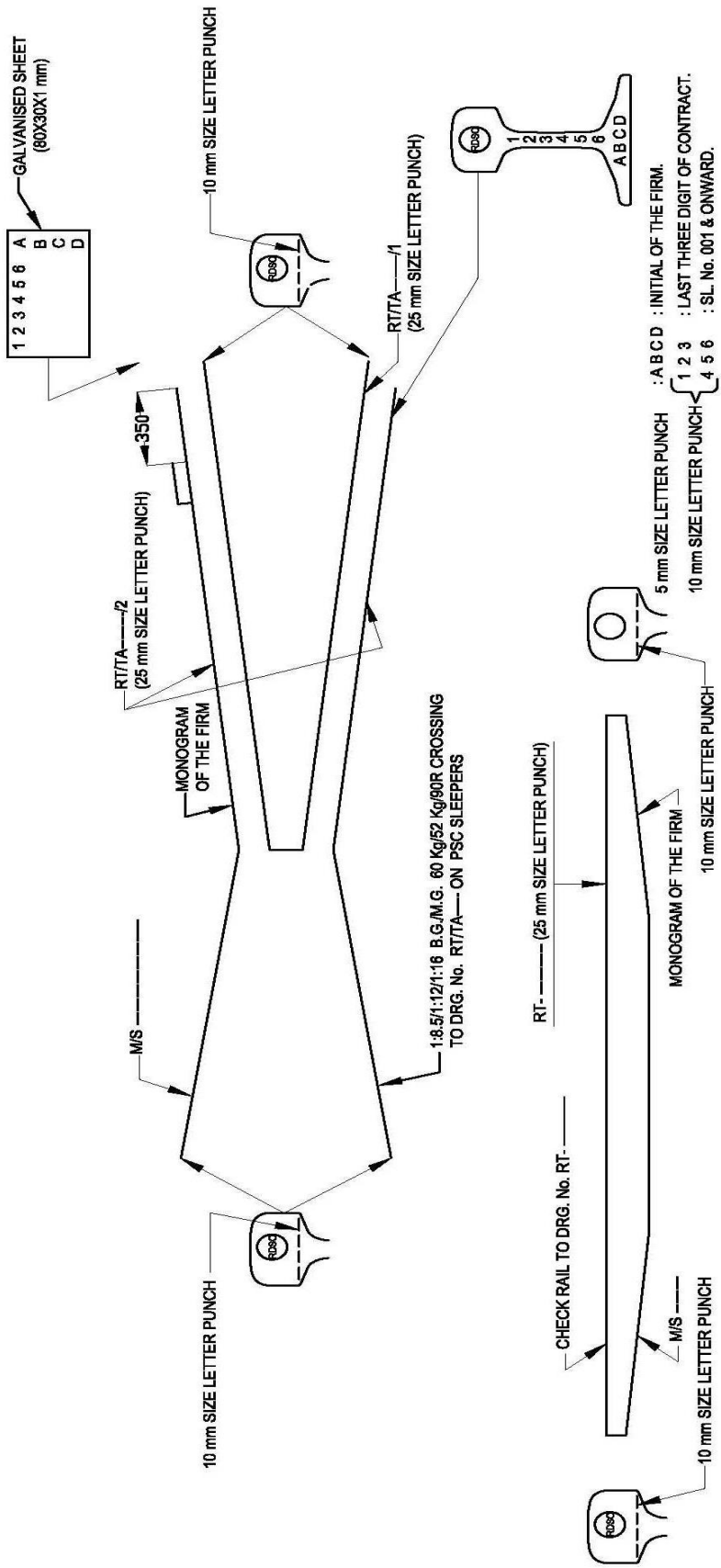
5 mm SIZE LETTER PUNCH	A B C D	1 2 3	: INITIAL OF THE FIRM. : LAST THREE DIGIT OF CONTRACT. : SL. No. 001 AND ONWARD. : STRAIGHT OR CURVED.
10 mm SIZE LETTER PUNCH		4 5 6	
		ST OR CR	



SPACE FOR STAMPING SHOWN THUS ----- 0

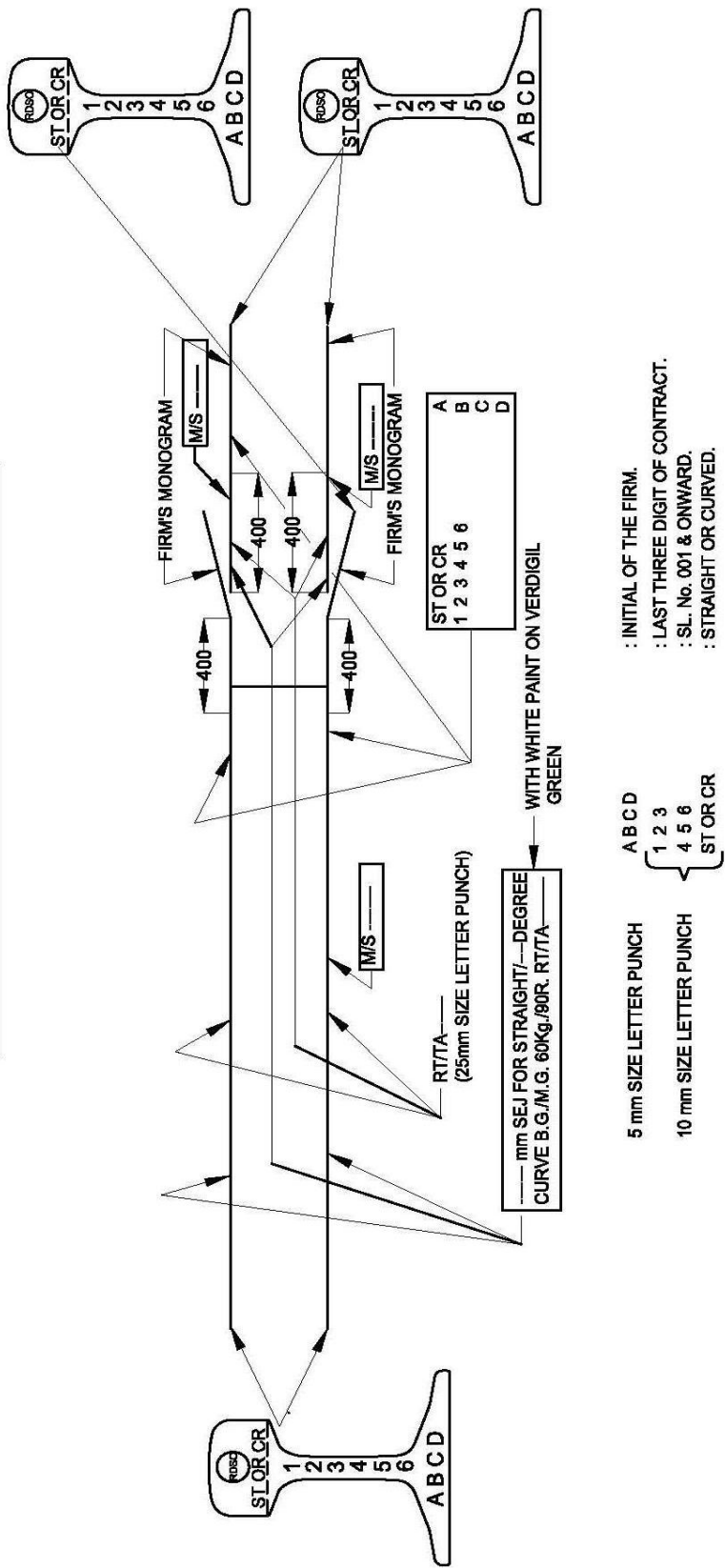
ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE AFTER FINAL VERDIGIL GREEN PAINT.

SAMPLE SKETCH SHOWING PUNCHING AND STENCILING TO BE DONE ON PASSED CROSSING AND CHECK RAILS DESPATCHED TO CONSIGNEE.



SPACE FOR STAMPING SHOWN THUS — 0
ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE AFTER FINAL VERDIGIL GREEN PAINT.

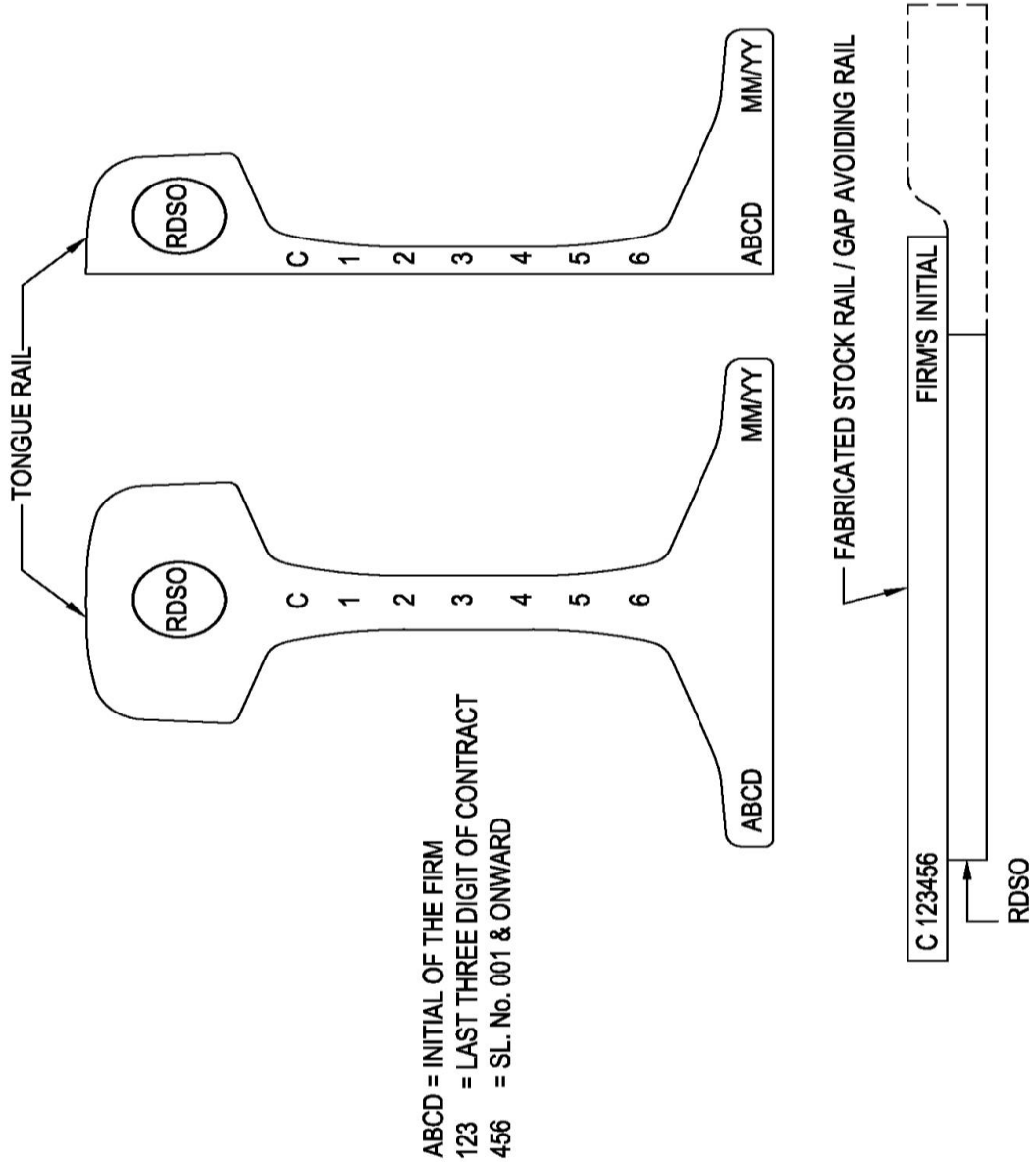
SAMPLE SKETCH SHOWING PUNCHING AND STENCILING TO BE DONE ON PASSED SEJs DESPATCHED TO CONSIGNEE.



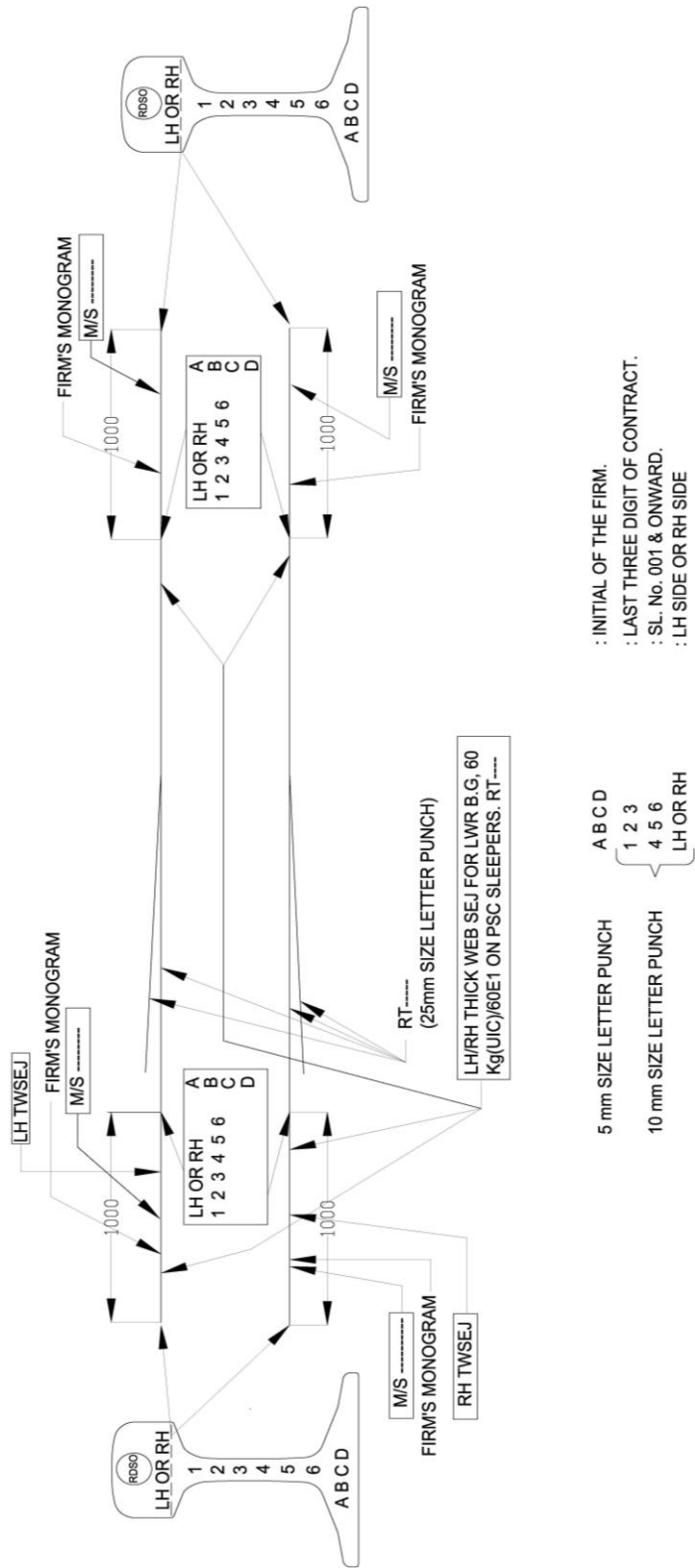
SPACE FOR STAMPING SHOWN THUS — 0

ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE AFTER FINAL VERDIGIL GREEN PAINT.

SAMPLE SKETCH SHOWING PUNCHING AND STENCILING TO BE DONE ON PASSED IMPROVED SEJ's DESPATCHED TO CONSIGNEE.



SAMPLE SKETCH SHOWING PUNCHING AND STENCILING TO BE DONE ON PASSED THICK WEB SWITCH EXPANSION JOINTS DESPATCHED TO CONSIGNEE.



SPACE FOR STAMPING SHOWN THUS O

ALL STENCILING TO BE DONE WITH WHITE PAINT IN 50 mm SIZE FOR STOCK RAIL AND 35 mm SIZE FOR THICK WEB TONGUE RAIL AFTER FINAL VERDIGIL GREEN PAINT.