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Date : 05.11.2014	



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No. CT/Rail Handling

As per Mailing List


Sub: Guidelines for handling and stacking of rails

Ref: Railway Board's letter no. Track/21/98/0508/7 dated 30.10.2014

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- 1.0 The rails, being the most vital component of track, require careful handling to achieve desired service life. Improper handling of rails may cause bending, indentation or damage to surface, rendering the rails unserviceable and/ or leading to premature failure of rails. The use of higher UTS Rails has been necessitated to meet the requirement of traffic. The rails of higher UTS (90 and above), being brittle in nature, are particularly susceptible to sudden fracture from locations of even minor dents/deformity. The presence of dent/deformation at the edge of the rail foot has been found as the main cause of premature fractures investigated by RDSO. As such, it is essential that P. Way officials at all levels are sensitized regarding precautions to be taken during unloading and handling of rails to prevent development of defects leading to premature or sudden failures.
- 2.0 The damage to rails including formation of dent/deformation at rail foot can be detected by inspecting rails before laying in track. Therefore, it becomes essential that Rails are thoroughly inspected at the level of SSE/P. Way for presence of damages to rails during transportation, unloading and handling, if any, before laying in the track. In case any damage is noticed, such rails should not be used in track without removal of damaged portion of rails.
- 3.0 These comprehensive guideline, approved by Railway Board vide letter under reference, are being issued for strict compliance at field level and sensitizing the field staff and other agencies involved in handling and laying of rails, so as to avoid damage to rails. The copy of "Guidelines for handling and stacking of rails (CT-35) October 2014" is enclosed herewith for information and strict compliance. The soft copy is also being e-mailed to Chief Track Engineers of Railway.

DA: As above

  
(Satish Kumar Pandey)  
Executive Director/Track-I  
for Director General/Track

**GUIDELINES**

**FOR**

***HANDLING AND STACKING OF  
RAILS***

**OCTOBER-2014**

**(No. CT-35)**

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**RESEARCH DESIGNS AND STANDARDS ORGANISATION**

**LUCKNOW – 226011**

## INSTRUCTIONS FOR HANDLING AND STACKING OF RAILS

### 1.0 INTRODUCTION:

- 1.1 On Indian Railways, various grade and sections of Rails are in use depending upon the traffic requirements. Use of higher UTS Rails has been necessitated to meet the requirement of traffic. Now almost all the new rails being manufactured are of 90 UTS. The 72 UTS rails (also known as MM Rails) used earlier were more ductile, hence were not susceptible to sudden fractures. Rails of higher UTS (90 and above), being brittle in nature, are susceptible to sudden fracture from locations of even minor dents. The presence of dent/deformation at the edge of the rail foot has been found as the main cause of premature fractures investigated by RDSO. The dent/deformation on the edge of the rail foot is formed mainly due to rubbing of rails during unloading and handling of rails at site. This is indicative of fact that due care is not being taken in field in handling of rails. Improper handling may cause bending, indentation or damage to surface, leading to premature failure of rails. As such, handling of rails with care and attention is important for achieving required service life of rails. It is essential that P. Way officials at all levels are sensitized regarding precautions to be taken during unloading and handling of rails to prevent development of defects leading to premature or sudden failures.
- 1.2 The instructions regarding handling of rails are available in various guidelines/ Manuals.
- (a) The detailed guidelines for handling of Rails were issued by RDSO vide letter no. CT/Rail/Handling dated 13.11.2006.
  - (b) Para 1.1.3 of Manual for Ultrasonic Testing of Rails and Welds (Revised - 2012) states that incorrect handling of rails may cause plastic deformation, scoring and denting of rails.
  - (c) Para 254 and Para 255 of IRPWM contains the guidelines on stacking of rails and the precautions to be taken during handling of rails in general.
  - (d) Para 310 of IRPWM covers the guidelines on unloading of rails.

These guidelines shall be strictly adhered to minimize formation of dent/ deformation at the edge of the rail foot and other damages to rails.

- 1.3 The damage to rails including formation of dent/deformation at rail foot can be detected by inspecting rails before laying in track. Therefore, it becomes essential that Rails are thoroughly inspected at the level of SSE/P. Way for presence of damages to rails during transportation, unloading and handling, if any, before laying in the track. In case any damage including dent/deformation is noticed, such rails should not be used in track without removal of damaged portion of rails.
- 1.4 These comprehensive guidelines are being issued for sensitizing the field staff and other agencies involved in handling and laying of rails, so as to avoid damage to rails.

## **2.0 HANDLING AND STACKING OF RAILS:**

### **2.1 Stacking and Handling of rails in rail manufacturing plants, Flash Butt Welding plants and other Bulk Storage locations:**

#### **2.1.1 Stacking of Rails and welded Panels:**

- (i) The rails shall be stacked on level and well drained base platform. For stacking on the level ground, unserviceable 90R or 52 kg rails should be embedded in the concrete bed of M-20 grade concrete keeping rail head embedded in concrete and rail flange projecting above concrete surface as shown in Drawing No. RDSO/T-6219 (Annexure-I). Intermediate distance between them should be 4.0 m. A slope of 1:400 may be given in the concrete bed across the length of rails for drainage of water as mentioned in the drawing.
- (ii) Mild steel flats of 100x25 mm size should be used between two successive layers of rails and kept at a distance not more than 4.0 m centre to centre. Number of layers in a stack should not be more than 10.
- (iii) One rail panel should be reduced after every third layer to achieve proper stacking of rails.
- (iv) Drawing no. RDSO/T-6219 (Annexure-I) shall be followed for stacking of free rails and welded panels.

### 2.1.2 Handling of Rails:

(i) Rail should be lifted preferably through magnetic chucks. In case magnetic lifting devices for rails cannot be provided, all handling of rails shall be done with synchronized electric hoists and spreader beams. This can be possible only when rails are stacked in layers properly.

#### (ii) Slings Principle:

The single point slinging increases risk of excessive bending and surface damage to the rails. The overhang portion of rail beyond the outer lifting point should not be greater than one-half the distance between two adjacent lifting points. Therefore, recommended locations of lifting points for various rail lengths shall be as per Table 1:

Table 1

Rail length (m)	No. of lifting points	Distance between two adjacent lifting points (m)	Max. rail end overhang (m)
12-13	2	6-6.5	3-3.25
26	4	6.5	3.25
39	6	6.5	3.25
130	20	6.5	3.25
260	40	6.5	3.25

## 2.2 Handling of Single/Three Rail Panels:

### 2.2.1 Loading of single rails/three rail panels:

- (i) Wagon should be fit for loading and transportation of rails. Minimum three bolsters/cross beams, one at center and others at maximum inter-distance of 5.0m should be available in wagon platform to give it a uniform base for rail placement. The rails should be loaded to obtain equal overhang at each end beyond the end bolsters. Availability of both end bulk heads in BFRs shall be ensured before loading of rails.
- (ii) All loaded rails should be tightened by suitably flexible but strong MS strip. While binding with MS strip, a card board or any other non-metallic material should be provided between rails and strip, so that abrasion/corrosion is avoided.

- (iii) Mild steel spacers made of flat of 100x25 mm size should be provided between two layers of rails at every 4.0 m distance interval.
- (iv) Shorter rails should be placed in upper layers so that each successive layer is of same or decreasing width to ensure centric and stable loading of wagons.

### **2.2.2 Unloading of single rails and 3 rail panels:**

- (i) Rails shall be unloaded fairly opposite to the position where they are to be laid. Care shall be taken to avoid unloading of materials in excess of actual requirement so as to avoid double handling.
- (ii) Two or more ramps should be made in the middle of BFR using unserviceable rails, with a maximum distance of 6.5 m between them. Intermediate supports using pre-fabricated props etc. may also be given below the ramps to prevent excessive sagging. Proper greasing should be done on top surface of ramps for lubrication and easy sliding of rails downwards.
- (iii) At the bottom end of ramp, gunny bag should be provided so that rails do not get damaged while unloading.
- (iv) Rail should be held by 2 or 3 rail tongues in middle portion and placed on the ramp. Both ends of the rail should be tied by manila rope. After placing on ramp, rails should be slid slowly by gradually releasing manila rope to reach the rails to placement location.

### **2.3 Handling of Long Welded Rail Panels:**

#### **2.3.1 Loading of long rail panels in EURs:**

- (i) Availability of proper end unloading rakes as per standard arrangement shall be ensured for loading of long rail panels. The speed certificate and sanction of competent authority for operation of rake must be available.
- (ii) The rake must be checked thoroughly before loading. All rollers should be available at their respective locations. Not even a single roller shall be missing or ineffective. It should also be checked that no roller is jammed i.e. it should be free to rotate.
- (iii) Rail panels should be lifted by multiple slinging arrangements keeping intermediate distance not exceeding 6.5 m centre to

centre following slinging principle mentioned at Para 2.1.2 (ii) above.

- (iv) Shorter length panel should be loaded in pairs and placed on same tier keeping equal distance from center so that they can be unloaded at same location.
- (v) Dynamic and localized loading in EUR rake shall be avoided.

### **2.3.2 Unloading of long rail panels from EURs:**

- (i) Unloading of rails from the End Unloading rake shall be done in traffic block.
- (ii) The unloading shall be started from Top layer panels. The protective rail and flap door of bulk head shall be opened during block only for the layer to be tackled. Once all the rails of that layer are unloaded, next layer door shall be opened for unloading.
- (iii) Rail panels should be tied with manila rope/slings with the help of HTS bolts through the holes provided at the end of panels. Only tested slings shall be used for unloading of welded panels.
- (iv) Rope should be passed through the arrangement fixed in ramper and threader wagons attached at the end of EUR rake to prevent rails from bending while unloading.
- (v) Height of rammers should be adjusted/ maintained with respect to the layer of rails being unloaded and it should be decreasing towards end of wagon. The height of ramper to be so adjusted that a smooth slope can be provided to the panels to be unloaded.
- (vi) Other end of manila rope should be tied to any fixed structure capable of pulling rail load and allow the rake to move forward at very cautious speed not exceeding 15kmph so that in the event of any unusual/unsafe situation the rake can be stopped immediately.
- (vii) Rail panels at equal distances from centre line shall be unloaded. Eccentric unloading or unloading from only one side of BFR is strictly prohibited.
- (viii) Just before complete unloading of first pair of rail panel, the rake should be stopped and next rail panel to be unloaded is tied with the near end of rail panel partially unloaded, with rope. Then, the rake should be moved forward to unload next rail panel. This process is to be continued for unloading of successive rail panels.
- (ix) The EUR rake shall never be moved backward during unloading.

- (x) The EUR rake shall not run either backward or forward with open door of bulk head in any circumstance except in block during unloading.
- (xi) In case, traffic block is to be cleared before complete unloading of rake, the clamps for layers, where rail panels are left shall be re-fixed properly before movement of rake to avoid any chance of movement of panel during run.
- (xii) Unloading shall not be undertaken at locations having vertical clearance less than 4500 mm from rail level to the fixed structure.
- (xiii) Unloading of rail panels shall not be undertaken in platform area and on ballast-less open web girder bridges.
- (xiv) Unloading of panels should be arranged in such a way that turnout and cross-overs are avoided.

#### **2.4 Placement of single rails and welded rail panels on cess:**

- (i) New rails should be unloaded on one side of the track on the cess leaving the other side free for stacking released rails. Rails should be placed on cess away from toe of ballast profile to avoid any infringement and disturbance to ballast profile.
- (ii) As far as possible, rail should be kept straight otherwise a smooth curvature may be given to cross any obstruction. Care must be taken not to unload rails one over the other as this causes bending of rails.
- (iii) While carrying rails, they shall be supported by rail tongs or rail slings at locations mentioned in Para 2.1.2 (ii) above.
- (iv) Rails should be so spread as to rest evenly along their entire length on supports closely spaced to prevent formation of kinks. Rails should be placed with head in upward direction. Drawing no. RDSO/T-8413 (**Annexure-II**) shall be followed for the purpose. Free rails should be supported at least at four points, evenly along their length.
- (v) Kinky rails must be jim-crowed and straightened before placing them in track.
- (vi) Rails must be inspected visually for any dent/rubbing marks on the edge of rail foot. Such rails shall be placed in the track only after removal of damaged portion.
- (vii) Punch marks on rails or marking by chisel should be prohibited as these cause incipient failures.
- (viii) On bridges, unloaded panels are to be supported on sleepers outside the track so as not to allow them to sag downwards.



- (ix) It shall be ensured that signaling bonds are not disturbed while placing the rails. In Track circuited territory, the rails shall be handled in such a way that rail does not contact both rails of track together to prevent track circuit failures.

## **2.5 Precautions for handling of rails in Electrified areas:**

- (i) In Electrified territory, no work shall be done without obtaining "permit - to work". Working under OHE shall be careful.
- (ii) Touching of fallen wires should be avoided unless power is switched-off and the wire or wires are suitably earthed.
- (iii) Loading and unloading shall be done under the supervision of an Engineering Official not below the rank of a SSE/P. Way who shall personally ensure that no tool or any part of body of worker comes within the "danger zone " i.e. within 2m of the OHE.
- (iv) Rails should not touch each other to form a continuous metallic mast of length greater than 300m.

## **2.6 Handling of Rails at port:**

- (i) Availability of proper facilities for handling of rails at Ports as required by these guidelines should be ensured.
- (ii) Magnetic lifting devices with suitable spreader beams should preferably be used. In case, it is not possible to provide magnetic lifting device for lifting of rails, electric hoists or cranes with suitable spreader beams may also be used so as to lift the rails in accordance with laid down basic principles.
- (iii) Suitable enabling provisions in the contract for procurement of for rails shall be ensured for carrying out modifications in the existing facilities available at ports or to develop suitable method for unloading and handling of rails so as to avoid any damage.

## **3.0 Precautions for preventing damage to rails:**

### **3.1 Protection of straightness:**

Proper straightness of rails is essential for smooth riding and preventing unusual stress during operation. Even the small variation of straightness, which is barely visible, (for example, a deflection of 0.75 mm over 1.5m span) renders a rail unacceptable. Therefore, careful handling and stacking shall be ensured particularly on following:

- (i) Heavy static loading on rails should not be done. Also, sudden impact should not be imparted to rails while unloading and handling.
- (ii) While stacking in layers, localised point or line contact loading should not be allowed. It should also be checked that rails are not stacked in criss-cross manner in alternative layers at right angles to each other.
- (iii) Excessive rail end overhang should not be allowed while lifting and shifting of rails. Overhangs mentioned in Table 1 shall be followed.
- (iv) Rails should be kept as horizontal and straight as possible while lifting/moving.
- (v) Rail ends are to be protected against damage by any impact even after having been stacked.

### **3.2 Protection of rail surface:**

Rails are very sensitive to notches and dents/deformations at the edge of the rail foot. Surface notches of even less than 0.25 mm in depth are liable to cause rail fracture in service. Therefore, to prevent rail surface from any damage, following shall be strictly ensured:

- (i) Rails shall be protected against impact or abrasion against separators in wagons, vehicles, hatches, ships etc. and also shall be protected against brushing, notching or scoring of rail surface.
- (ii) Electro-magnetic lifting devices shall be used for lifting of rails. In case of non-availability of such device, conventional slings made of flat link chains fitted with fabric sleeves can be used for lifting rails. Round link chain slings should not be used for securing the rails.
- (iii) Any rail support, handling or clamping devices and rail pinch rollers shall not apply localized or point contact to the rail and must not have sharp edges. Wherever possible, the profile of rail support, handling and clamping devices should be contoured to rail profile.

### **3.3 Prevention of metallurgical damages:**

Rails are thermally very sensitive and are likely to develop metallurgical defects, if exposed to localized heating. The localized heating produces very hard and brittle metallurgical structures, which may lead to sudden failures. Therefore,

- (i) No work of heating, flame cutting, spot welding on or adjacent to rails should be done.
- (ii) Rails should not be in contact with (a) loose electric cables to produce arcs, and (b) molten metal splashes from adjacent welding operations.

### **3.4 Protection from contact with injurious substances:**

All rail in general and 90 UTS or higher grade rails in particular due to higher carbon content, are sensitive to localized corrosion and pitting, which may cause subsequent rail fractures. Therefore, contact of rails with injurious substances causing corrosion of steel, i.e. acids, alkalis, salts, fertilizers, sulphate, chlorides, nitrates etc. should be avoided.

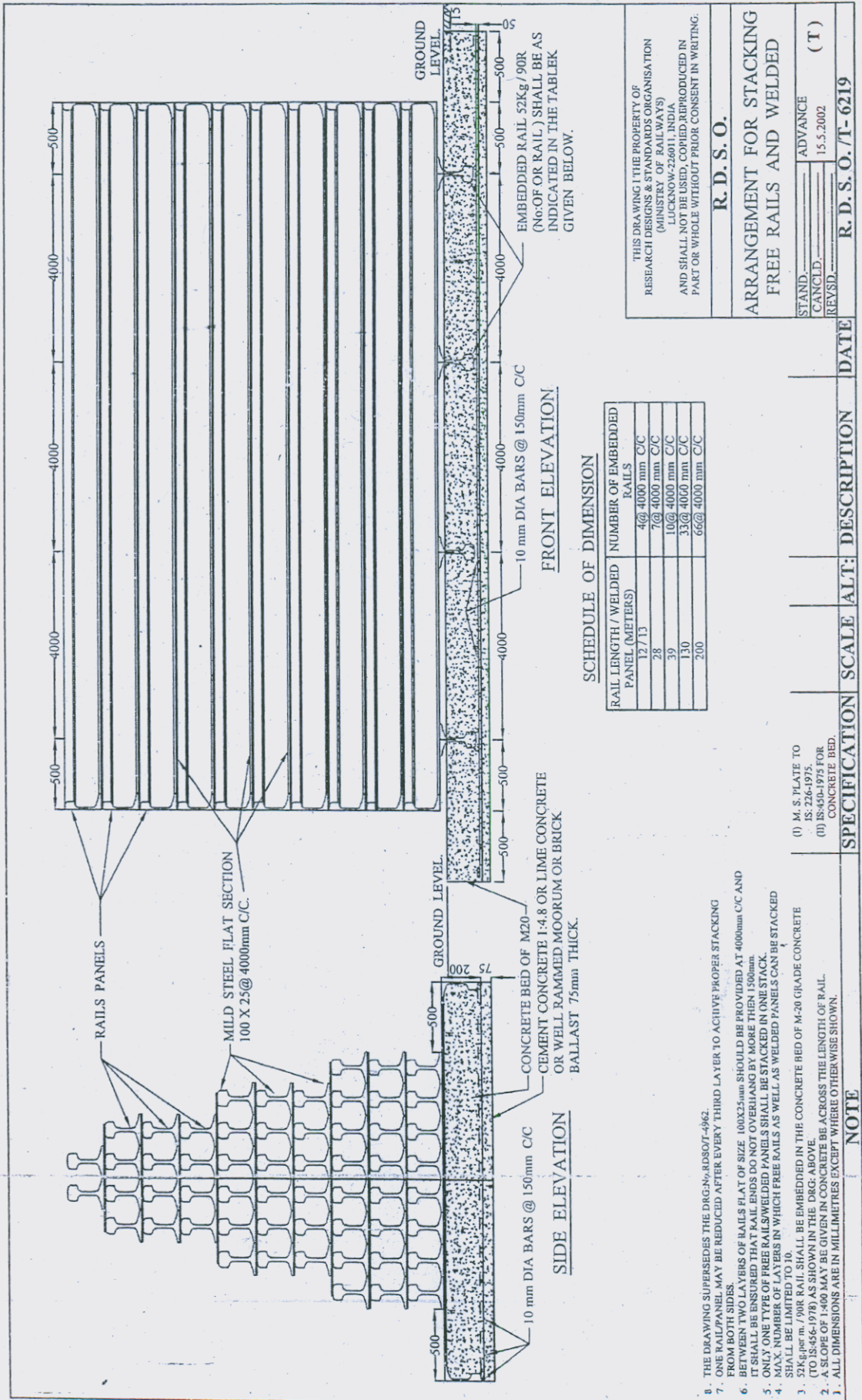
### **4.0 Safety of Personnel:**

Safety of personnel involved in handling of rails is of utmost importance. Following precautions must be ensured for safety of personnel-

- (i) The staff deputed for unloading of EUR rakes must never travel on BFRs. They shall travel only in tool van/ separate wagon provided in rake composition. No staff shall be allowed on ramper/threader during movement of rake from one station to another station where rake is moving for non-block activity.
- (ii) Trackmen/staff shall not be allowed to stand between bulkhead doors and panels on either side of the formation while rake is on run.
- (iii) The staff must use protective gloves and clothing to minimize the risk of skin abrasion, lacerations and extremes of temperature.
- (iv) Handling of rails shall be done using proper tools and equipments approved by SSE (P.way) incharge. No locally made arrangements shall be used.
- (v) The staff must wear distinctive coloured helmet and clothing for easy identification by crane and other machine operators to avoid accidents.
- (vi) The staff shall use steel toe-capped protective footwear
- (vii) The staff shall be properly trained and cautioned to avoid standing under suspended loads, sudden dropping and impact of rails.

- (viii) Safe working in the vicinity of electrical conductors and cables shall be ensured.
  - (ix) The rails should never be carried by staff on the head or shoulder.
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ANNEXURE-I



SCHEDULE OF DIMENSION

RAIL LENGTH / WELDED PANEL (METERS)	NUMBER OF EMBEDDED RAILS
12/13	4@ 4000 mm C/C
28	7@ 4000 mm C/C
39	10@ 4000 mm C/C
130	33@ 4000 mm C/C
200	66@ 4000 mm C/C

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**R. D. S. O.**  
**ARRANGEMENT FOR STACKING FREE RAILS AND WELDED**

STAND.	ADVANCE	( T )
CANCELLED.	15.5.2002	
REVISED.		

R. D. S. O. / T-6219

SPECIFICATION	SCALE	ALT.	DESCRIPTION	DATE
(1) M. S. PLATE TO IS: 226-1975. (2) BS-454-1975 FOR CONCRETE BED.				

NOTE

1. ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.
2. A SLOPE OF 1:400 MAY BE GIVEN IN CONCRETE BE CROSS THE LENGTH OF RAIL.
3. 52Kg/90R RAIL SHALL BE EMBEDDED IN THE CONCRETE BED OF M-20 GRADE CONCRETE (IS: 456-1978) AS SHOWN IN THE DRG. ABOVE.
4. MAX. NUMBER OF LAYERS IN WHICH FREE RAILS AS WELL AS WELDED PANELS CAN BE STACKED SHALL BE FOUR.
5. ONLY ONE TYPE OF FREE RAILS/WELDED PANELS SHALL BE STACKED IN ONE STACK.
6. IT SHALL BE ENSURED THAT RAIL ENDS DO NOT OVERHANG BY MORE THAN 150mm BETWEEN TWO LAYERS OF RAILS FLAT OF SIZE 100x25mm SHOULD BE PROVIDED AT 4000mm C/C AND FROM BOTH SIDES.
7. ONE RAIL/PANEL MAY BE REDUCED AFTER EVERY THIRD LAYER TO ACHIVE PROPER STACKING.
8. THE DRAWING SUPERSEDES THE DRG. No. RDSO/T-4962.

ANNEXURE - II

