

Office of the General Manager,

Integ. Coach Factory, Lucknow-11

Date / Date: 11-8-97

Ref. No. 218/P

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESEARCH, DESIGN AND STANDARD ORGANISATION

मुख्य कार्यालय
OFFICE OF THE CME
IR NO. 1212

Manak Nager,
Lucknow-11

Dated 10-7-97

No. SS/IRS M41-97

12 AUG 1997

Mech.

The General Manager, Engg. Stores,
All Indian Railways, C.M.E., Lucknow, 38
DGM, YCF, RCF.

Chennai-600038

Regard.

Sub:-IRS Specification No. M 41-97 (Revised.)

One copy of the above IRS Specification No. M41-97 is sent herewith for use in your Office and distribution among the Offices under your control. More copies if required, may be supplied by this Office,

DA/As above.

(S.MANI.)
for Director General/MP

Copy forwarded to:-

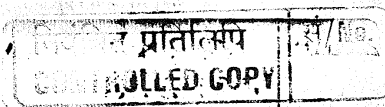
The Secy. Mech. Engg. Railway Bd. Rail Bhawan New Delhi-110001.
The Secy. Rly. Stores Railway Bd. Rail Bhawan New Delhi-110001.
The Librarian Rly. Bd. Rail Bhawan, Room No. 135 New Delhi-110001.
The Principal Railway Staff College, Vadodara-390004.
The Railway Advisor EMBASSY OF INDIA, RAILWAY WING,
ADENAUERALLEE, 262-264-53113 BONN, GERMANY.
The Controller of Publications, Govt. Of India, Department
of Publications, Civil Lines, Delhi-54 (5 copies for sale.)
The Alloy Steel Plant, M/s Steel Authority of India Ltd.,
Durgapur-713208.
M/s ESSAR STEEL Ltd, 21 Feroze Gandhi Road, Lajpat Nagar-III,
New Delhi-110024.
M/s TISCO, Jamshedpur-831001.
M/s LLOYED STEEL INDIA Ltd., Steel Division, LLOYED Nagar,
P.O. Box No. 25, WARDHA-442001.
The Exe. Dir. Carr, Wagon, M&C & MP (RDSO Lko. for information Pl.)

DA/As above.

(S.MANI.)
for Director General/MP

CME

CDE/M



IRSM-41-97

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)



CONTROLLED COPY

INDIAN RAILWAY
FOR
CORROSION RESISTANT STRUCTURAL STEEL
REQUIRED FOR ROLLING STOCK
SERIAL NO. IRS:M-41-97

0. **FOREWORD**

0.1 This specification is issued under the fixed serial number M-41, the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision.

PROVISIONALLY ADOPTED 1974, REVISED 1993 AND 1997:

0.2 This specification has been revised to:

- i) Cater to cold rolled finished products also.
- ii) Cater to supply of sheets & plates in coil form also.

0.3 This issue supersedes 1974 edition, its corrigendum No.1 of Nov.1990 and corrigendum No.2 of Dec.1990 and 1993 edition.

0.4 This specification draws reference to the following specifications (latest versions).

| Sl No. | Specification No. | Description |
|-----------|----------------------|---|
| a. | IS:228 | Methods for chemical analysis of steel |
| b. | IS:513 | Specification for cold rolled low carbon steel sheets and strips (Third Revision) |
| c. | IS:1599 | Method of bend test (Second Revision) |
| d. | IS:1608 | Method for tensile testing of steel products (First Revision) |
| e. | IS: 1663 | Method for tensile testing of steel sheet and strip of thickness 0.5 mm |

- | | | |
|----|--------------|---|
| f. | IS: 1730 | to 3 mm (First Revision) Dimensions for steel plate, sheet and strip for structural and general engineering purposes. Part-I Plate (First Revision) Part-II Sheet (First Revision) |
| g. | ISO:5952 | Continuously hot rolled steel sheet of structural quality with improved atmospheric corrosion resistance |
| h. | IS:2062-1984 | Specification for weldable structural steel |
| i. | IS:9595-1980 | Welding procedure (4th Revision) |

1. SCOPE

1.1 This specification covers the requirements for corrosion resistant steel sheets (below 5 mm thick) and plates (5 mm to 12.5 mm thick) in two grades and sections as follows:

1.1.1 Sheets and Plates (In Flat or Coil Form)

Grade-I: Intended for structural purposes where
guaranteed mechanical properties, weldability
and suitability for forming simple cold
pressed parts are required.

Grade-II: Intended for general engineering purposes
with guaranteed mechanical properties and
weldability.

1.1.2 Sections:

Intended for general engineering purposes with guaranteed mechanical properties and
weldability.

1.2 The manufacturer can supply sheets, plates and sections either in hot rolled and if
required in as skin passed or cold rolled and annealed condition only or hot rolled followed by
cold finishing or cold rolled and annealed. In case of cold rolled finished supply, there shall,
however, be no adverse effects on the properties of the product. The manufacturing process
adopted for cold rolling/finishing shall be furnished in detail by the supplier.

2. MANUFACTURE

Steel shall be manufactured by the electric, basic oxygen or a combination of these
processes. In case any other process is employed by the manufacturer, prior approval of the
purchaser shall be obtained.

3. CHEMICAL COMPOSITION

3.1 Ladle Analysis:

The ladle analysis of steel when carried out either by the methods specified in relevant parts of IS:228 or by any other established instrumental/chemical method, shall be as per Table-I. In case of any dispute the procedure given in relevant parts of IS:228 shall be the reference method.

TABLE - 1

CHEMICAL COMPOSITION %

| C | Mn | Si | Ni | Cu | Cr | S | P | Incidental Elements |
|------|------|------|------|------|------|------|-------|---------------------|
| 0.10 | 0.25 | 0.28 | 0.20 | 0.30 | 0.35 | 0.03 | 0.075 | Mo= 0.05 max |
| max. | to | to | to | to | to | max | to | V = 0.05 " |
| | 0.45 | 0.72 | 0.47 | 0.60 | 0.60 | | 0.140 | Al= 0.08 " |
| | | | | | | | | Nb= 0.04 " |

(Total incidental elements = 0.15 max)

3.2 Product Analysis:

An analysis from each cast of the product shall be done. Permissible variation from the limits specified in

Table - 1, shall be as given below:

| Constituent | Variation over the specified limits percent | Constituent | Variation over the specified limits percent |
|-------------|---|-------------|---|
| C | + 0.02 | Cu | + 0.05 |
| Mn | ± 0.05 | Cr | ± 0.05 |
| Si | ± 0.03 | S | + 0.005 |
| Ni | ± 0.03 | P | + 0.005 |

4. TENSILE TEST

4.1 Number of Tensile Tests:

4.1.1 One tensile test shall be taken from each lot of 50 tonnes or part thereof from each cast. However, in the case of sheets supplied after heat treatment, one tensile test shall be conducted for each heat treated batch or a lot of 50 tonnes, or part thereof per cast.

4.1.2 Where plates or sections of more than one thickness are rolled from the same cast, one additional tensile test shall be made from the material in each class of product for each

variation in thickness of 6 mm above or below the thickness of the test piece first selected in such a class.

4.1.3 Where sheets of more than one thickness are rolled from the same cast, one additional tensile test shall be made for every thickness.

4.2 TENSILE TEST PIECES

4.2.1 Test specimen shall be prepared from the sheets, plates and sections in finished condition and tested for plates and sections in accordance with IS:1608 and for sheets in accordance with IS:1663.

4.2.2 Test sample shall be cut length-wise and cross-wise to the direction of rolling from plates and sheets and length-wise from sections.

4.3 MECHANICAL PROPERTIES

4.3.1 The tensile strength, yield stress and elongation percentage shall be as follows:

| | Hot rolled | Cold rolled |
|------------------|--------------|-------------|
| Tensile strength | 480 MPa min. | 440 MPa min |
| Yield strength | 340 MPa min | 300 MPa min |

Elongation

On GL 5.65 $\sqrt{S_0}$ 22% min 26% min

GL is gauge length
SO is cross sectional area

4.3.2 If the percentage of elongation of any tensile test piece is less than that specified in clause 4.3.1 and any part of the fracture is outside the middle half of the gauge length, the test shall be discarded and a retest shall be made.

5. BEND TEST

5.1 One bend test shall be taken from each lot of 50 tonnes of sheets and 50 tonnes of plates and sections or part thereof from each cast. However, in the case of sheets supplied after heat treatment, one bend test shall be conducted for each heat treated batch or a lot of 50 tonnes or part thereof per cast.

5.2 Where plates, sheets and sections or more than one thickness are rolled from the same cast, one additional bend test shall be made from every thickness.

5.3 BEND TEST PIECES

5.3.1 The test pieces shall be cut lengthwise and crosswise to the direction of rolling from plates and sheets and lengthwise from sections.

5.3.2 The rough edge or arris resulting from shearing may be removed by filing or grinding or machining. Test pieces shall receive no other preparation.

5.3.3 Bend test shall be conducted in accordance with IS:1599 (Method of test).

5.3.4 The bend test specimen shall withstand being bent at ambient temperature in any direction through 180 degree around a former of diameter equivalent to the thickness of the material without cracking on the outside of the bent portion.

6. LOCATION OF TESTS SAMPLE

6.1 Samples for chemical analysis and test pieces for tensile and bend test shall be drawn from standard location for plates and sections as given in IS:2062 and for sheets from any conventional location.

7. RETEST

7.1 Should any of the test pieces first selected fail to pass any of the tests specified in this standard, two further samples shall be selected from the same lot for testing in respect of each failure. Should the test piece from both these additional samples pass, the material represented by the test samples shall be deemed to comply with the requirement of that particular test. Should the test pieces from either of these additional samples fail the material represented by the test samples shall be deemed to be not conforming to this standard and shall be rejected.

8. FREEDOM FROM DEFECTS

8.1 All finished material shall be well and cleanly rolled to the dimensions and weights specified. The finished material shall be free from cracks, surface flaws, laminations, rough jagged and imperfect edges and all other harmful defects. The sheets shall be reasonably flat and the edges cleanly sheared and truly squared to the specified dimensions. The coil shall be supplied with edges trimmed. The trimming of edges may be carried out either by the supplier or the coach/wagon builders which may be decided between the purchaser and the supplier.

9. SURFACE FINISH

9.1 Plates and Sections:

The plates and sections shall be well and cleanly rolled. Minor surface defects may be removed by the manufacturer by grinding, provided the thickness is not reduced locally by more than 4 percent.

9.2 Sheets:

Sheets may be supplied in any of the following surface conditions as stipulated by the purchaser.

9.2.1 Surface Finish SF1:

Uniform dull finish to surface roughness range 0.6 to 1.8 microns and free from rust and scales. Pits, grooves, scratches and pores are permissible to a limited extent so that on viewing with naked eye, uniformly smooth appearance is not impaired. The surface finish may be obtained if required through a suitable combination of pickling and skin passing or pickling, cold rolling and annealing.

9.2.2 Surface Finish SF 2:

Rolled condition with reasonably smooth surface free from harmful surface defects.

10. WELDABILITY

10.1 The plates and sections shall be suitable for gas and metal arc welding.

10.2 The sheets shall be suitable for gas and metal arc welding as suitable for spot and seam welding processes.

11. DIMENSIONS AND TOLERANCES:

11.1 Dimensions of steel plates, sheets in flat form, shall conform to the dimensions specified in IS:1730 unless otherwise agreed to between the purchaser and the manufacturer/supplier.

11.2 The plates and sheets in coil form shall have:

| | |
|-------------------|--------------------------------|
| Inner dia of coil | 450 - 850 mm |
| Outer dia of coil | 700 - 1600 mm |
| Weight of coil | 10 t max. |
| Width of coil | As per purchaser's requirement |

11.3 Unless otherwise agreed to between the purchaser and the manufacturer/supplier, the tolerances for plates, sheets and sections for thickness, width with mill edge and sheared edge, length, camber, out of square and flatness shall be as per Annexure I.

11.4 The telescopicity of the coil shall not exceed more than 50 mm.

12. INSPECTION

12.1 The purchaser or his Inspecting Officer shall have free access to the works of the manufacturer at all reasonable times and he shall be at liberty to inspect the manufacture at any stage and to reject material that does not conform to the terms of this specification.

12.2 Testing Facilities:

12.2.1 The manufacturer shall supply the material required for testing free of charge and shall at his own cost, furnish and prepare the necessary test pieces and supply labour and appliances for such testing as may be carried out on his premises in accordance with this specification. Failing to provide the facilities at his own works for making the prescribed tests, the manufacturer shall bear the cost of carrying out the tests in a laboratory/test house selected by the Inspecting Officer or the purchaser.

13. MARKING

13.1 Each product shall be stamped /painted with material specification, code of surface finish, the cast number and the manufacturer's name or trade mark. In case of sheets, the bundle shall carry a metal tag bearing the above. Alternatively, the top sheet shall be legibly marked material specification cast number and manufacturer's name or trade mark.

14. PROTECTION AND PACKING

14.1 Packing method for plates above 5 mm:

14.1.1 Plates supplied shall be provided with reasonable packing with metal strapping for handling during transit and storage.

14.2 Plates/Sheets in Flat Form:

14.2.1 The sheets of 1.6 mm, 2 mm, 3.15 mm, and 4 mm and plate of 5 mm thickness shall be supplied in bundles with double layer of water proof paper or single layer of coated hessain

am
ns
1-
cloth or HDPE cloth and metal protection in edges. All the sheets shall be protected against corrosion and rust with suitable mineral oil or other temporary rust preventive coating.

14.2.2 All bundles shall have a minimum of 2 hoops upto 1.2 metre in length and one extra hoop for every additional metre. The bundles shall also be provided with skid (wooden packing underneath) to facilitate handling.

14.3 Sheets in Coil Form:

The coils shall be protected in reasonably good condition to withstand normal handling hazard during transit with the following provisions as the barest minimum.

- i) Plastic laminate paper or hessian cloth around the coil
- ii) Steel angle 4 - 1.0 x 50 x 100 mm on the outer and inner corner/metal ring in the eye.
- iii) Coils to be securely strapped with 4 bands through the eyes of the coil and 3 bands on the circumference of the eye
- iv) Hot Rolled Coils shall be supplied with rust preventive oil coating on the outer layer, inner layer and on both edges.
- v) Coils processed through pickling and or skin passing or cold rolling shall be supplied with rust preventive oil coating on both surfaces and edges.

14.4 Due care shall also be taken to avoid mechanical damage and corrosion during transit.