



COLD ROLLED
PRODUCTS

Cold Rolled Coils and Sheets



Bokaro Steel Plant : Rationalised sizes of CR Coils

| Thickness (mm) | Width (mm) |
|------------------|---|
| 0.27, 0.30, 0.35 | 900, 905, 910, 914, 920 |
| 0.40, 0.45 | 900, 905, 910, 914, 920, 1000, 1005, 1010, 1020 |
| 0.5 | 900, 905, 910, 914, 920, 1000, 1005, 1010, 1020, 1105, 1120 |
| 0.55, 0.58 | 900, 905, 910, 914, 920, 1000, 1005, 1010, 1020, 1105 |
| 0.60 | 900, 905, 910, 914, 920, 1000, 1005, 1010, 1020, 1100, 1105, 1120, 1250, 1270 |
| 0.63 | 900, 905, 910, 914, 920, 1000, 1005, 1010, 1020, 1100, 1105, 1120, 1219, 1250, 1270 |
| 0.70 | 900, 905, 910, 914, 920, 1000, 1005, 1010, 1020, 1105, 1219, 1250, 1270 |
| 0.8, 0.9 | 900, 914, 920, 1000, 1020, 1120, 1219, 1250, 1270, 1420 |
| 0.95 | 900, 914, 920, 1000, 1020, 1120, 1219, 1250, 1270 |
| 1.00 | 900, 914, 920, 1000, 1020, 1120, 1219, 1250, 1270, 1320, 1420, 1520, 1580 |
| 1.25, 1.40 | 900, 914, 920, 1000, 1020, 1120, 1219, 1250, 1270, 1320, 1420, 1520, 1580, 1620 |
| 1.5, 1.6, 1.85 | 900, 914, 920, 1000, 1020, 1120, 1219, 1250, 1270, 1320, 1420, 1520, 1580, 1620 |
| 1.90, 2.00 | 900, 914, 920, 1020, 1120, 1219, 1250, 1270, 1320, 1420, 1520, 1580, 1620 |

In respect of 0.20/0.22/0.25 mm thick CR Coils, 900 & 920 mm shall be considered as rationalized widths for Full Hard/TS513 CR OH quality only.

Bitumen Barrel Size

| | |
|-----------------|----------------------------|
| 0.63 | 876, 896, 1120 |
| (Barrel Size) : | |
| 0.9 | 914, 920, 1225, 1320 |
| 1, 1.2, 1.25 | 914, 920, 1225, 1320, 1580 |

Coil Dimension : Outer diameter : 2200 mm, maximum. Internal diameter : 510 mm (thickness 0.63 mm and below and width up to 1020 mm) and 600 mm (for other sizes) and Coil weight: 6-23 tonnes (as per size)

Tolerance as per IS /ISO – 16162/2005

Common Grades : IS 513 (Part-1):2016 (CR1, CR2, CR3, CR4), IRSM 41, SAILCOR, Copper Bearing, HSCR - 26/35. Bokaro Steel Plant also produces cold rolled coils and sheets to the following foreign specifications : ASTM A 568/366, BS-1449-Pt-1, JIS G 3141 SPCC/CD, DIN-1623 St 12.3 or equivalent, if sufficient orders are available.

Rourkela Steel Plant : Rationalised sizes of CR Coils

| Thickness (mm) | Width (mm) |
|----------------|---------------|
| 0.35, 0.4 | 900 |
| 0.5, 0.63 | 900/1000 |
| 0.8, 1.0, 1.25 | 900/1000/1250 |
| 1.85, 2.0 | 1250 |

Coil weight : 3 to 15 tonnes for width above 1100 mm and 3 to 10 tonnes up to 1100 mm width.

Coil Internal Diameter : 610 mm (CR-1 route) and 510 mm (Tandem Mill route).

Common Grades : IS 513/2008 Grade

Note : Some quantity may be available in mixed thicknesses of 0.3 - 0.5 mm and mixed widths of 750-1000 mm

Bokaro Steel Plant : Rationalised sizes of Cold Rolled Sheets

| Thickness (mm) | Width (mm) | Length (mm) |
|---------------------------------------|--------------------------------------|------------------------|
| 0.60, 0.63, 0.70 | 900, 1000, 1100, 1250 | 2000, 2500, 3000, 3600 |
| 0.80, 0.90 | 900, 1000, 1100, 1250, 1400 | 2000, 2500, 3000, 3600 |
| 1.00, 1.25, 1.50, 1.60, 1.85, 2.00 | 900, 1000, 1100, 1250, 1400, 1500 | 2000, 2500, 3000, 3600 |
| Barrel Size | | |
| 1.0/1.25 | 915, 920 | 1815 |
| 1.0/1.25 | 1315, 1320 | 1970, 2000 |

Common grades : IS 513/2008 (O, D, DDK, EDB), IRSM 41, SAILCOR, Copper Bearing
 CR coils/sheets are supplied in oiled/unoiled condition as per customers' requirements.
 Tolerance as per IS - 513/IS/ISO/16162 (2005)

Rourkela Steel Plant : Rationalised sizes of Cold Rolled Sheets

| Thickness (mm) | Width (mm) | Length (mm) |
|----------------|------------|-------------|
| 1.0, 1.25, 1.6 | 1250 | 2500 |

Common grades : IS 513/2008 Grade
 Tolerances as per IS 513/IS/ISO 16162 (2005)

Packaging : CR Coils

Coils are first packed with paper and high-density polythene and then secured with steel strapping. A coil is strapped with three eye and two circumferential straps. For identification, one sticker and one metallic tag with a sticker are provided. These are then loaded into wagons with the eye of the coil in horizontal position. Coils are then unitised by strapping.

Packaging : CR Sheets

These are packed in packets of 3 - 10 tonnes each and covered with high density polythene and paper. Thereafter, these are bound with steel straps. They also have stickers inside the packets and metal tags attached to the strips.

Table 1 : Normal thickness tolerances for coils and sheets

Dimensions and tolerances in millimetres

| Specified width | Thickness tolerances ^{a, b} for specified thicknesses ^c | | | | | | | | | |
|-----------------|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | ≤ 0.4 | >0.4 ≤0.6 | >0.6 ≤0.8 | >0.8 ≤1.0 | >1.0 ≤1.2 | >1.2 ≤1.6 | >1.6 ≤2.0 | >2.0 ≤2.5 | >2.5 ≤3.0 | >3.0 ≤4.0 |
| 600 ≤ 1200 | ±0.04 | ±0.05 | ±0.07 | ±0.08 | ±0.09 | ±0.11 | ±0.13 | ±0.15 | ±0.18 | ±0.20 |
| > 1200 ≤1500 | ±0.50 | ±0.06 | +0.08 | ±0.09 | ±0.10 | ±0.12 | ±0.14 | ±0.16 | ±0.19 | ±0.21 |
| ≥1500 ≤1800 | - | ±0.08 | ±0.09 | ±0.10 | ±0.12 | ±0.14 | ±0.16 | ±0.18 | ±0.21 | ±0.23 |

Thickness is measured at any point on the sheet not less than 25 mm from a side edge.

Table 2 : Width tolerances for coils and sheets

Dimensions and tolerances in millimetres

| Specified width | Tolerance |
|-----------------|-----------|
| ≤1200 | +3 0 |
| > 1200 ≤1500 | +5 0 |
| > 1500 | +5 0 |

Table 3 : Length tolerances for sheets

Dimensions and tolerances in millimetres

| Specified width | Tolerance |
|-----------------|---------------------|
| ≤2000 | + 10 0 |
| > 2000 ≤8000 | +0.5% X length 0 |
| > 8000 | +40 0 |

Note: For resquared material, more restrictive tolerances are subject to negotiation.

Chemical Composition : IS 513 : 2016

| Designation (Quality) | Grade | Carbon | Manganese | Sulphur | Phosphorus |
|-------------------------|---------|--------|-----------|---------|------------|
| | % Max | % Max | % Max | % Max | % Max |
| Cold Rolled (Full Hard) | CRO | 0.35 | 4.00 | 0.035 | 0.050 |
| | CR1 | 0.15 | 1.00 | 0.035 | 0.080 |
| General Purpose | CR2 | 0.12 | 0.50 | 0.035 | 0.040 |
| | CR3 | 0.10 | 0.45 | 0.030 | 0.025 |
| | CR4 | 0.08 | 0.45 | 0.030 | 0.020 |
| | CR5 | 0.06 | 0.25 | 0.020 | 0.020 |
| | ISC270C | 0.12 | 0.50 | 0.035 | 0.040 |
| Drawing Quality | ISC270D | 0.10 | 0.45 | 0.030 | 0.025 |
| | ISC270E | 0.08 | 0.40 | 0.030 | 0.020 |
| | ISC270F | 0.06 | 0.25 | 0.020 | 0.020 |
| | ISC340W | 0.12 | 0.90 | 0.030 | 0.050 |
| C, Mn Steel | ISC370W | 0.15 | 1.30 | 0.030 | 0.050 |
| | ISC390W | 0.20 | 1.50 | 0.030 | 0.050 |
| | ISC440W | 0.20 | 1.70 | 0.030 | 0.050 |

NOTES :

1. Restricted chemistry can be mutually agreed to between the purchaser and the manufacturer.
2. When the steel is aluminium-killed, the total aluminium content shall not be less than 0.02 percent. When the steel is silicon-killed, the silicon content shall not be less than 0.10 percent. When the steel is aluminium silicon killed, the silicon content shall not be less than 0.03 percent and total aluminium content shall not be less than 0.01 percent. If mutually agreed to between the purchaser and the manufacturer, for aluminium-killed steel, aluminium content can be less than 0.02 percent.
3. For grades where non-ageing characteristics are defined, Nitrogen content shall be 0.007 percent maximum. For grades where non-ageing characteristics are not defined, Nitrogen content shall be 0.012 percent maximum. This shall be ensured by the manufacturer by occasional check analysis.
4. The steel can be made with microalloying elements like Chromium, Nickel, Niobium, Vanadium, Titanium, molybdenum, Boron, Calcium and others, either added individually or in combination. However, in case of Boron, the limit shall be 0.005 percent maximum.
5. Phosphorus limit of 0.12 percent maximum can be added and in such cases, carbon content shall be limited to 0.15 percent maximum.

Mechanical Properties : IS 513 : 2016

| Grade | Yield Point or Proof Stress Mpa, Max | Tensile Strength Mpa, Max | Minimum Elongation | | Mean Plastic Strain Ration r-Bar | Tensile Strain Hardening Component n-Value | Test Direction |
|-------|--------------------------------------|---------------------------|--------------------|--------------------|----------------------------------|--|----------------|
| | | | Gauge Length 80 mm | Gauge Length 80 mm | | | |
| CR1 | 280 | 410 | 27 | 28 | - | - | T |
| CR2 | 240 | 370 | 30 | 31 | - | - | T |
| CR3 | 220 | 350 | 34 | 35 | 1.3 min | 0.16 min | T |
| CR4 | 210 | 350 | 36 | 37 | 1.4 min | 0.19 min | T |
| CR5 | 190 | 350 | 38 | 40 | 1.7 min | 0.22 min | T |

Mechanical Properties

| Grade | Minimum Tensile Strength Mpa | Yield Point or Proof Stress Mpa | | Elongation, percent Gauge Length 50 mm | | | | | | | | Amount of Bake Hardening BH Mpa | Test Piece Direction | Mean Plastic Strain Ratio r-Bar | Strain Hardening Component n-Value | | | | | |
|---------|------------------------------|---------------------------------|----------|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------------------------|----------------------|---------------------------------|------------------------------------|-------|-------|---|---|-------|
| | | Thickness, t, mm | | Thickness, t, mm | | | | | | | | | | | | | | | | |
| | | t < 0.40 | t ≥ 1.00 | t < 0.40 | 0.40 ≤ t < 0.60 | 0.60 ≤ t < 0.80 | 0.80 ≤ t < 1.00 | 1.00 ≤ t < 1.20 | 1.20 ≤ t < 1.60 | 1.60 ≤ t < 2.00 | 2.00 ≤ t < 2.50 | | | | | | | | | |
| ISC270C | 270 | 155-275 | 145-265 | 0.40 ≤ t < 0.80 | 135-255 | 125-245 | 37-46 | 37-46 | 37-46 | 37-46 | 37-46 | 37-46 | 37-46 | 37-46 | 37-46 | 37-46 | - | L | - | - |
| ISC270D | 270 | - | 135-225 | 125-215 | 115-205 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | 40-49 | L | - | ≥0.15 |
| ISC270E | 270 | - | 130-205 | 120-195 | 110-185 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | 42-50 | L | - | ≥0.18 |
| ISC270F | 270 | - | 120-185 | 110-175 | 100-165 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | 44-52 | L | - | ≥0.20 |
| ISC340W | 340 | - | 185-285 | 175-275 | 165-265 | - | 33-43 | 34-44 | 35-45 | 36-46 | 37-47 | - | - | - | - | - | - | T | - | - |
| ISC370W | 370 | - | 205-305 | 195-295 | 185-285 | - | 30-40 | 31-41 | 32-42 | 33-43 | 34-44 | - | - | - | - | - | - | T | - | - |
| ISC390W | 390 | - | 245-355 | 235-345 | 225-335 | - | 29-40 | 30-41 | 31-42 | 32-43 | 33-44 | - | - | - | - | - | - | T | - | - |
| ISC440W | 440 | - | 285-390 | 275-380 | 265-370 | - | 26-38 | 27-39 | 28-40 | 29-41 | 30-42 | - | - | - | - | - | - | T | - | - |

| Specification | Grade | C max | Min max | S max | P max | Al min | Si max | MAE max |
|---------------------------------|----------|----------|-------------|--------|---------------|-------------|-------------|--|
| IS 15391:2003 | SAIL RIM | 0.11 | 0.07 - 0.45 | 0.35 - | 0.04 | 0.04 | | 0.06 |
| Semi Processed Electrical Steel | | 0.05 max | 0.25 - 0.50 | 0.02 | 0.025 max | 0.08 - 0.12 | 0.5 - 0.7 | |
| IRSM-41 | SAILCOR | 0.1 max | 0.25 - 0.45 | 0.03 | 0.075 - 0.140 | 0.08 max | 0.28 - 0.72 | Ni : 0.2 - 0.47 Cu : 0.3 - 0.6 Cr : 0.35 - 0.6 |

| Specification | Grade | YS, MPa | UTS, MPa | % El min 80 mm GL | n bar | r bar |
|---------------|---------|---------|----------|-------------------|-------|-------|
| IRSM-41 | SAILCOR | 300 | 440 min | 26 | | |

Output from the new CRM mill at Bokaro

| | | | |
|-----------|-----------------|----------------------|--------------------|
| Thickness | - 0.25 – 2.0 mm | Coil OD | - 1000 – 2000 max |
| Width | - 800 – 1560 mm | Coil weight | - 31 tonnes max |
| Coil ID | - 500 mm | Specific Coil weight | - 20 kg / mm (max) |

Applications

| Specification | Size | Application |
|--|---------------------------|--|
| Full Hard IS 513 O un-annealed | 0.27 to 0.60 mm thickness | Coated Sheets |
| SAILNOX - IS: 513 O (Sk)/D (K) | Bitumen and Barrel sizes | Packaging |
| SAIL PRESS - IS: 513 D/DD/EDD | All sizes | Household applications Automobile |
| IS: 513 O (Sk)/D (K) | 0.8 to 2 mm thickness | Precision tubes |
| SAILCOR (IRSM41) | 1.25 to 2 mm thickness | Railway Coaches/Wagons |
| IS: 513 O/D with Cu | 0.63 to 2 mm thickness | Corrosion resistance applications |
| SAILRIM, SAILHUB SAILMUDGUARD | 0.56 to 0.9 mm thickness | Cycle manufacturing |
| SEMI PROCESSED ELECTRICAL STEEL, SAIL LEC | 0.5 to 0.63 | Fractional Horse Power Motors & Electrical Applications |
| ISC 340/370/390/440W | 0.8 to 2.0 | Load bearing components for automobiles, Roll formed sections, Industrial storage systems, Drums, Barrels etc. |