Steel
Carbon, Alloy and Bearing Steels for Various Industrial Applications
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ISMT is an established market leader in special engineering steels. We produce carbon, alloy and martensitic stainless steel bars with special emphasis on ultra-clean steels, free machining steels, bearing steels, and other specially engineered steel grades. With over 15 years of experience in the manufacture of special steels, our strength lies in our ability: to produce very clean steels consistently and cost effectively; to produce hard to manufacture free machining steels; to develop and custom produce steels that meet specific mechanical and metallurgical requirements; and to deliver small lots of steels.

MODERN EQUIPMENT AND METHODS

We operate one of the most modern alloy steel plants in the country located at Jejuri, near Pune. All our steel is produced through the electric arc furnace (EAF) route, is ladle refined, vacuum degassed, continuous cast and rolled. The primary equipment is supplemented by best in class quality enhancing devices such as an automatic mould level controller, non-sinusoidal tundish oscillators, electro-magnetic stirrers etc., with the singular objective of producing the best steel.

CAREFULLY CHOSEN INPUTS

The quality of inputs for melting has a direct bearing on the quality of the output. For this reason, we melt a very carefully chosen mix of virgin metal (pig iron and DRI) and clean scrap so as to control the appearance of tramp elements. We have a trusted set of suppliers - all of whom are periodically audited to ensure adherence to our standards. In addition, we test all incoming material for radiation and other hazardous contaminants.
CLEAN STEEL PROCESS

ISMT prides itself on manufacturing the cleanest steel in the country, on par with the best worldwide – this is entirely attributable to our steel making practices.

While good equipment is a prerequisite for making clean steel, at ISMT we believe that good practices are even more vital. While modern equipment may be procured at a cost, good practices are much more difficult to develop and institutionalize – it takes determination, time and painstaking effort. For this reason, throughout our 15 years of steel making history, we have focused on developing process knowhow, training people, and creating a committed quality culture.

We are proud to say that our processes and practices are second to none. We follow a strict de-oxidation practice to ensure that macro inclusions of alumina and silica are floated out quickly from the molten metal. We ensure that the slag in the LRF is synthesized quickly and that the slag volume and chemistry are appropriate for complete slag killing. Similarly, low re-oxidation at the caster is ensured by controlling the superheat, achieving free opening consistently, and by adhering to proper tundish and mould practice.

APPLICATION BASED STEEL MAKING

At ISMT, we like to understand where our steel is used. Wherever possible, our Technology Process Group (TPG) interacts with customers at the shop floor and at the R&D level to translate the customers’ product requirement into a steel specification and a steel making process specification. This “application based” approach enables to deliver the most suitable and cost effective product. Today, given our history and our approach, we have developed an understanding of hundreds of applications that use our steels and we can use that experience to help you either select a steel or to develop a new grade appropriate to your requirements.
## PROCESS FLOW CHART FOR MANUFACTURE OF CARBON & ALLOY STEELS

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<th>PROCESS FLOW</th>
<th>FACILITY</th>
<th>MAJOR ACTIVITIES/PROCESS CONTROL CHECK POINTS</th>
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<td>1 Scrap / Metallics</td>
<td></td>
<td></td>
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<tr>
<td>2 Primary Melting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Secondary Refining &amp; Ferro Alloy Addition</td>
<td></td>
<td></td>
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<tr>
<td>4 Vacuum Degassing</td>
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</tr>
<tr>
<td>5 Continuous Casting of 160/180/200/225 MM Rounds</td>
<td></td>
<td></td>
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<tr>
<td>6 Inspection of Blooms</td>
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<td>7 Rolling</td>
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<td></td>
</tr>
<tr>
<td>8 Finishing Operations and Inspections</td>
<td></td>
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</tr>
</tbody>
</table>

**Facility Details**

- **Scrap / Metallics:**
- **Primary Melting:**
- **Secondary Refining & Ferro Alloy Addition:**
- **Vacuum Degassing:**
- **Continuous Casting of 160/180/200/225 MM Rounds:**
- **Inspection of Blooms:**
- **Rolling:**
- **Finishing Operations and Inspections:**

**Check Points**

1.1 Checking of charge mix as per standard.
2.1 Addition of fluxes for early slag formation.
2.2 Check for chemistry.
2.3 Process observation and monitoring.
3.1 Addition of fluxes for early slag formation of desired chemistry for achieving a high degree of cleanliness.
3.2 Addition of alloying elements.
3.3 Check for chemistry.
3.4 Same as 2.3.
3.5 Superheat control.
4.1 Check for chemistry before trimming addition.
4.2 Same as 2.3.
5.1 Check for as cast macro and chemistry
5.2 Control of parameters with respect to casting speed, mould oscillation, EMS frequency and current and tundish temperature.
6.1 Macro routine check.
7.1 Monitoring of reheating furnace controls.
7.2 Checking of dimension and surface quality during rolling.
8.1 MPI/pickling and inspection, eddy current testing.
8.2 Ultrasonic testing.
8.3 Cut to length.
8.4 Colour coding.
PROCESS FLOW

FACILITY

MAJOR ACTIVITIES/PROCESS CONTROL CHECK POINTS

8.5 Straightening of bars.
8.6 Spark / spectral testing of the lot for mix-up detection by the mobile spectrometer / metascope.
8.7 Bundling and tagging.

9.1 Metallurgical tests like chemistry, macro, micro inclusions, grain size, decarb, step down, gas analysis, blue fracture, mechanical properties and other required tests.
9.2 Testing and certification as per technical delivery conditions.

10.1 Monitoring of heat treatment cycle.
10.2 Checking of hardness, micro structure and mechanical properties.

9
METALLURGICAL TESTING


10
HEAT TREATMENT

Electrically operated bogie hearth furnace for: annealing, normalising, spheroidised annealing.

11
DISPATCH
# Product Information

<table>
<thead>
<tr>
<th>Installed Capacity</th>
<th>350,000 MT/annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Route</td>
<td>EAF - LRF - VD - CCM - RM</td>
</tr>
<tr>
<td>Heat size</td>
<td>45 MT</td>
</tr>
<tr>
<td>Products</td>
<td>As Cast Rounds, Rolled Round Corned Square (RCS), Bright Bars (Peeled/Turned) Cold Drawn/Cold Finished</td>
</tr>
</tbody>
</table>

## Size Range
- **As Cast Rounds**: 160, 180, 200 and 225 mm dia.
- **Rolled Rounds**: 25.4 to 115 mm dia for all applications and 125 to 170 mm dia for seamless tube industry
- **Round Corned Square (RCS)**: 45 to 75 mm and 125 mm

## Standard Hot Rolled Sizes
- **Rounds**: 25.4, 26, 26.4, 27, 28.3, 30, 32, 34, 36, 38, 40, 42, 45, 48, 50, 52, 56, 60, 63, 65, 70, 75, 80, 85, 90, 95, 100, 105, 115, 125, 137, 150, 170 mm and as cast - 160, 180, 200 & 225 mm
- **RCS**: 45, 50, 52, 55, 60, 63, 65, 70, 75 mm and 125 mm

*Additional sizes/shapes upon specific request/agreement.*

## Supply Lengths
- Standard 3 to 6 m with 10% shorts down to 1 m or user defined.

## Straightness Tolerance
- **Hot Rolled**: 3.0 mm per meter
- **Hot Rolled and Machine Straightened**: 1.5 mm per meter
- **Cast Product**: 5.0 mm per meter

## Length Tolerance for Fixed Length Supply
- +50, -0.00 mm

## Conditions of Ends
- Standard Gas Cut / Hot Sheared (as per customer requirements.)

## Standard Size Tolerance for Hot Rolled Bars/Billets

<table>
<thead>
<tr>
<th>Nominal Size (mm RCS)</th>
<th>Over</th>
<th>Upto and including</th>
<th>Tolerance on size</th>
<th>Ovality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25.4</td>
<td>28</td>
<td>+0.25</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>31</td>
<td>+0.28</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>34</td>
<td>+0.30</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>38</td>
<td>+0.36</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>50</td>
<td>+0.40</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>64</td>
<td>+0.8, -0</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>89</td>
<td>+1.2, -0</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>114</td>
<td>+1.6, -0</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>114</td>
<td>139</td>
<td>+2.0, -0</td>
<td>1.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal Size (mm RCS)</th>
<th>Over</th>
<th>Upto and including</th>
<th>Tolerance on size</th>
<th>Out of squarness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
<td>50</td>
<td>+0.6</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>64</td>
<td>+1.2, -0</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>89</td>
<td>+1.8, -0</td>
<td>1.30</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>100</td>
<td>+2.4, -0</td>
<td>1.80</td>
</tr>
</tbody>
</table>

Tolerance on weight Kg per meter shall be +4%, -0%

For cast rounds size tolerance shall be +3mm and ovality 2.5% of dia.

*Alternative tolerances upon specific request/agreement.*
### Grades (Illustrative)

**Plain Carbon Steels**
- SAE 1008, SAE 1010, SAE 1012, SAE 1019, SAE 1026, SAE 1035, SAE 1040, SAE 1045, SAE 1518, 070M20, 080M40, 080M46, 070M55, CK35, CK45, CK55, CK60 etc., and equivalent.

**Case Hardening Steels**
- 665M23, 635M15, 637M17, 815M17, 820M17, 822M17, SAE8617, SAE8620, 15C03, 16M0Cr5, 20MnCr5, 15C0Ni6, SCM415, SCM420, SCM421 etc., and equivalent.

**Spring Steels**
- E55/7, 60S/7, 37MnSi5, 50CrV4, 38XCr, 50CrV4, 51CrMoV4, 52CrMo2V etc., and equivalent.

**Free Cutting Steels**
- SAE 1117, SAE 1141, SAE 1140, SAE 1141, 216M36, SAE 1144, EN 8M, EN 1A etc., and equivalent.

**Ball Bearing Steels**
- SAE 52100, 100Cr6, SUJ 2 etc., and equivalent.

**Micro Alloyed Steels**
- HMnV, 38MnSi5, 49MnS3, C7056 etc., and equivalent.

**Other Alloy Steels**
- SAE 4130, SAE 4135, SAE 4140, SAE 4340, 817M40, 34Cr4, 37Cr4, 41C4, 25GMo4, 42C0Mo4, 40NiCrMo4, 40NiCrMo15, SCM435, SCM440, SA182F11, SA 182FI2, SA 181F11, F-5, T-9, T-23, T-91 etc., and equivalent.

**Ferritic Stainless Steels**
- AISI-410, AISI-420

**Tool Steels**
- H-11 and H-13

### Control Chemistry

<table>
<thead>
<tr>
<th>Element</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>03</td>
</tr>
<tr>
<td>Manganese</td>
<td>05</td>
</tr>
<tr>
<td>Sulphur</td>
<td>10</td>
</tr>
<tr>
<td>Chromium</td>
<td>05</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>05</td>
</tr>
</tbody>
</table>

### Tramp Elements (max.)

<table>
<thead>
<tr>
<th>Element</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tin</td>
<td>0.02%</td>
</tr>
<tr>
<td>Copper</td>
<td>0.15%</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.20%</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.20%</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.05%</td>
</tr>
<tr>
<td>Boron</td>
<td>4 ppm max</td>
</tr>
</tbody>
</table>

### Grain Size Guarantee

ASTM 5 to 8

Alternative grain size upon specific request / agreement.

### Inclusion Rating Guarantee

**Carbon & Alloy Steels**
- Thin series ABCD - 2 max. Thick series ABCD - 1.5 max or as per customer requirements.

**SAE 52100**
- Thin and Thick series A - 1.0 max, B - 0.5 max, C - nil, D - 0.5 max.

Alternative inclusion rating upon specific request / agreement.

### Oxygen Level

**Carbon & Alloy Steels**
- 25 ppm max

**Bearing Steels**
- 15 ppm max

Alternative oxygen level upon specific request / agreement.

### Hydrogen Level

2 ppm max.

### Nitrogen Level

80 ppm max.

### Titanium Level

30 ppm max. in Ball Bearing Steels

### Calcium Level

10 ppm max.

### NDT Facilities

- Ultrasonic testing, Spark, Spectral, Mobile spectrometer, MPI testing

### Finish Supply Condition

- As Rolled
- Annealed
- Normalised
- Spheroidised Anealed
- Quench & Tempered
- Bright Bars
- Drawn
- Peeled
- Ground

Alternative finish supply condition upon specific request / agreement.
ISMT manufactures carbon/alloy steel and seamless tubes for:

- Energy and Power Generation
- Automotive Components
- Hydraulic and Pneumatic Pressure Lines
- Hydraulic Cylinders
- Gas Cylinders
- Mining and Construction
- Bearings
- General Engineering Applications
- Oil and Petroleum Applications

Product details are available on request