
	<h1 style="margin: 0;">CORPORATE PURCHASING SPECIFICATION</h1>	<div style="border-bottom: 1px solid black; padding: 2px;">AA10108</div> <div style="border-bottom: 1px solid black; padding: 2px;">Rev No. 11</div> <div style="padding: 2px;">PAGE 1 of 2</div>																		
<h2 style="margin: 0;">STRUCTURAL STEEL-STANDARD QUALITY</h2> <h3 style="margin: 0;">(PLATES, SECTIONS, STRIPS, FLATS &amp; BARS)</h3> <h3 style="margin: 0;">(ORDERING DESCRIPTION)</h3>																				
<p><b>1.0 GENERAL:</b></p> <p>This specification governs the quality requirements of structural steel plates, strips, flats, bars and sections such as angles, beams, channels and tees etc. of IS: 2062 – 2011, Gr: E250, Quality A</p> <p><b>2.0 APPLICATION:</b></p> <p>For general engineering purpose.</p> <p><b>3.0 CONDITION OF DELIVERY:</b></p> <p>Plates, Bars &amp; Sections: Hot rolled in straight lengths without twists &amp; Bends</p> <p><b>4.0 COMPLIANCE WITH NATIONAL STANDARDS:</b></p> <p>Material shall comply with the requirements of IS: 2062 – 2011, Gr: E250, Quality A</p> <p>Material offered to EN 10025-2:2004 Gr. S275JR is also acceptable. The tolerance on dimensions for plates shall comply with EN 10029.</p> <p><b>5.0 DIMENSIONS AND TOLERANCES:</b></p> <p><b>5.1 DIMENSIONS:</b></p> <p><b>5.1.1 Sizes</b></p> <p>Material shall be supplied to the dimensions specified on BHEL Order.</p> <p><b>5.1.2 Length</b></p> <p>Unless otherwise specified, hot rolled bars and sections shall be supplied in 3 to 6 metres length.</p> <p><b>5.2 Tolerances:</b></p> <p><b>5.2.1</b> The tolerances on hot rolled material shall comply with IS: 1852. However, no plate shall be under the specified thickness at any point.</p>																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3" style="padding: 5px;"> <b>Revisions:</b> As per Cl. No. 38.1 of MOM of MRC-S&amp;GPS         </td> <td colspan="3" style="text-align: center; padding: 5px;"> <b>APPROVED:</b> INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&amp;GPS)         </td> </tr> <tr> <td style="width: 16.6%; padding: 5px;">Rev No.11</td> <td style="width: 16.6%; padding: 5px;">Amd No.</td> <td style="width: 16.6%; padding: 5px;">Reaffirmed</td> <td style="width: 16.6%; padding: 5px;">Prepared</td> <td style="width: 16.6%; padding: 5px;">Issued</td> <td style="width: 16.6%; padding: 5px;">Dt. of 1<sup>st</sup> Issue</td> </tr> <tr> <td style="padding: 5px;">Dt:22-02-2014</td> <td style="padding: 5px;">Dt:</td> <td style="padding: 5px;">Year:</td> <td style="padding: 5px;">44HPEP, Hyderabad</td> <td style="padding: 5px;">Corp.R&amp;D</td> <td style="padding: 5px;">July, 1976</td> </tr> </table>			<b>Revisions:</b> As per Cl. No. 38.1 of MOM of MRC-S&GPS			<b>APPROVED:</b> INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)			Rev No.11	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 <sup>st</sup> Issue	Dt:22-02-2014	Dt:	Year:	44HPEP, Hyderabad	Corp.R&D	July, 1976
<b>Revisions:</b> As per Cl. No. 38.1 of MOM of MRC-S&GPS			<b>APPROVED:</b> INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)																	
Rev No.11	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 <sup>st</sup> Issue															
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**5.2.2 Straight for hot rolled bars:**

Unless otherwise specified, the permissible deviation in straightness shall not exceed 5 mm in any 1000 mm length.

**6.0 HARDNESS (BRINELL):**

When tested in accordance with IS: 1500, the material shall show a brinell hardness in the range of 120-156 HB.

Note: Hardness test shall be conducted only when tensile test cannot be performed.

**7.0 TEST CERTIFICATES:**

Unless otherwise specified, three copies of test certificates shall be supplied.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information.

AA10108 Rev.11 / IS:2062 Grade: E250 Quality A / EN 10025-2 Gr. S275JR,

BHEL order no., Melt no. Size, Results of chemical analysis and Mechanical tests, Supplier's name, Identification no. TC no., Signature of competent authority etc.


**8.0 PACKING AND MARKING:**

Plates shall be transported suitably to avoid damage during transit.


For plates below 10 mm thick, each pile (preferably of 16 plates) and each plate 10 mm thick & over shall be marked with melt no. AA10108, BHEL order no., Supplier's name, Identification no., Size & weight on any one corner and encircled with paint preferably of white colour.

**9.0 REFERRED STANDARDS (Latest publications including amendments):**

1) IS: 1500                      2) IS: 1852                      3) EN 10029

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<b>BRIGHT STEEL BARS AND SECTIONS (STANDARD QUALITY)</b>						
<b>1 GENERAL:</b>  This specification governs the quality requirements of Bright Steel Bars and Sections of standard quality, such as I-beams and equal angles required in very small sections.						
<b>2 APPLICATION:</b>  Bars are used in the manufacture of threaded and machined components for general engineering purposes. Sections are used as stator spacer plate vents in generators.						
<b>3 CONDITION OF DELIVERY:</b>						
<b>3.1 Round Bars - Class 4, surface quality.</b> Up to 50 mm diameter - Cold drawn.  Above 50mm diameter - Cold drawn or Hot rolled, turned and polished						
<b>3.2 Rectangular/Square/Hexagonal Bars - Class 3, surface quality.</b> All sizes - Cold drawn.						
<b>3.3 Sections - Class 4, surface quality.</b> All sizes - Cold drawn						
<b>3.4 Bars and sections shall be straight, with their ends sheared, square and true and shall have a smooth surface.</b>						
<b>3.5 The bars and sections shall be given a clear temporary rust preventive (TRP) coating to avoid corrosion during transit and storage.</b> Black TRP coating is not acceptable.  Clear TRP used shall be free from pungent smell.  The following clear TRP's are suggested:						
a) Servo RP 150 - M/s Indian Oil Corporation b) HE - 1612 - M/s. BHEL, Bhopal c) Rustilo DW-901 - M/s. Indrol Lubricants and Specialties Ltd. d) Rustpro Special - M/s. Tide water oil co. e) Any other clear TRP conforming to IS: 1154						
<b>4 COMPLIANCE WITH NATIONAL STANDARDS:</b>  The material shall comply with the requirements of the following National standards and also meet the requirements of this specification.  IS: 9550-2001 : Bright steel bars						
<b>Revisions:</b> CI 27.2.d of MOM of MRC-S&GPS				<b>APPROVED:</b> INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)		
Rev No.07	Amd No.	Reaffirmed	46	Prepared HEP, Bhopal	Issued Corp.R&D	Dt. of 1 <sup>st</sup> Issue September 1976
Dt:15-06-2005	Dt:	Year:2019				

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**5 DIMENSIONS AND TOLERANCES:**

**5.1 Sizes:**  
Bars shall be supplied to the dimensions specified in BHEL order.

**5.2 Tolerances:**

**5.2.1 Rectangular/Square/Hexagonal/Flat Bars:**  
Unless otherwise specified, tolerances on dimensions shall be as follows:  
For drawn round bars and turned bars h10 to table 2 of IS:9550  
For hexagonal and square drawn bars upto and including 80mm h11 and above 80mm h12 according to table 2 of IS:9550  
For drawn flats in accordance with table 3 and 4 of IS:9550  
For ground products in accordance with table 1 and 2 of IS:9550

**5.2.2 Sections:**  
As specified in BHEL order/drawing.

**5.3 Length:**  
Bar and sections shall be supplied in lengths of 2.5 to 4.5 meters with maximum 10% of shorts of not less than 1.5 meters.

**5.4 Straightness:**  
Unless otherwise agreed to, the permissible deviation shall not exceed 1.5mm in any one meter length. Bars and sections shall be free from twists and bends.

**6 MATERIAL:**  
The rolled bars used for purpose of producing the bright bars shall be such, so as to ensure freedom from segregation, piping and other harmful defects.

**7 MANUFACTURE:**  
Steel shall be manufactured by the open-hearth, electric, basic oxygen or a combination of these processes.


**8 FREEDOM FROM DEFECTS:**  
All finished steel bars and section shall be sound and free from internal and surface defects. They shall be bright and clean.

**9 SURFACE CONDITION:**

**9.1 Round Bars and Sections:**  
Shall be entirely free from cracks and other surface defects.

**9.2 Rectangular/Square/Hexagonal Bar-Type '3' Finish:**  
Shall comply with IS: 9550, Class 3 of table 5.

**10 CHEMICAL COMPOSITION:**  
The melt analysis of steel and the permissible variation in the composition of the material form the melt analysis shall be as follows:

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Element	Melt analysis percent, max	Permissible variation percent
Carbon	0.25	± 0.02
Sulphur	0.040	+ 0.005
Phosphorus	0.040	+ 0.005

**11 TEST SAMPLES:**

One sample for chemical and tensile test shall be selected from finished steel for every 20,000 kg or part thereof, with a minimum one per heat.

**12 MECHANICAL PROPERTIES:**

When tested in accordance with IS:1608, the test pieces shall show the following properties:

**12.1 Rectangular/Square/Hexagonal/Section - Cold Drawn:**

Tensile Strength : 440 N/mm<sup>2</sup>, min

Elongation on  $5.65\sqrt{S_0}$  gauge length : 8 – 20%

**12.2 Round Bars:**

**12.2.1 Bars upto 50mm Diameter – Cold Drawn**

Tensile Strength : 440 N/mm<sup>2</sup>, min

Elongation on  $5.65\sqrt{S_0}$  gauge length : 8 – 20%

**12.2.2 Bars above 50mm Diameter:**

Cold drawn or hot rolled, turned and polished.

Property	Hot rolled, turned and polished		Cold drawn
Tensile strength, min.	: 410 N/mm <sup>2</sup>		440 N/mm <sup>2</sup>
Elongation on $5.65\sqrt{S_0}$ gauge length	: 23%, min	OR	8-20%

**13 TEST CERTIFICATES:**

Three copies of test certificates shall be supplied, unless otherwise stated on the order.

In addition, to the above, the supplier shall ensure to enclose one copy of the test certificate along with their despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA10112; Rev. No. 07 :

BHEL order No,

Supplier's Reference:

Name

Identification No.

Melt No.

Results of Tests:

Dimensional inspection.

Results of Chemical analysis and mechanical tests.

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**14 PACKING AND MARKING**

The material shall be suitably packed in bundles – polythene wrapped to prevent sagging, corrosion and damage during transit. A suitable clear temporary rust preventive shall be applied all the bars as per clause 3.5 above and finally dispatched in wooden boxes.

Each bar over 50mm shall be stamped at one end with 'AA10112'. Bars 50mm and below shall be bundle together and tied with wire at 3 to 4 places along the length of the bar.

A metal label shall be securely attached to each bundle and shall bear the following information:

AA10112: BRIGHT STEEL BARS AND SECTIONS (STANDARD QUALITY)

BHEL Order No.

Consignment/Identification No.

Melt No.

Size and Weight.

Supplier's Name.

**15 REFERRED STANDARDS** (Latest Publications Including Amendments):

- 1) IS: 1154                      2) IS: 1608                      3) IS: 9550



# CORPORATE PURCHASING SPECIFICATION

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## HOT ROLLED CARBON STEEL SHEET (330 N/mm<sup>2</sup> Tensile)

### 1.0 GENERAL:

This specification governs the quality requirements of Hot Rolled Carbon Steel Sheet of thickness of 2.5 mm to 4.0 mm (both inclusive).

### 2.0 APPLICATION:

Suitable for cold forming / drawing / fabrication by welding.

### 3.0 CONDITION OF DELIVERY:

Sheets shall be supplied in hot rolled, decaled and oiled condition. Imported sheets shall be supplied in straight lengths. The edges shall be flattened and sheared. Mill edges are not acceptable. Sheets shall be free from waviness and shall have a uniformly dull (matt) finish.

Oil used for rust prevention should be free from pungent smell. The following oils are suggested:

- SERVO RP 125 of M/s. IOC.
- RUSTOP 387/388 of M/s. HPC
- Bharat TCPF of M/s. Bharat Petroleum
- Any other TRP conforming to IS : 1154

### 4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following National standards and also meet the requirements of this specification.

IS: 5986 – 2011, Gr.: 205: Hot rolled steel flat products for structural forming and flanging purposes - Specification.

### 5.0 DIMENSIONS AND TOLERANCES:

#### 5.1 Sizes:

Hot rolled carbon steel sheets shall be supplied to the dimensions in BHEL order.

#### 5.2 Tolerances:

The tolerances on sheets shall comply with the following:

##### 5.2.1 Thickness (IS: 1852):

Thickness, mm	Tolerance, mm
2.50	± 0.20
3.15	± 0.22
4.0	± 0.25

#### Revisions:

As per Cl.No.38.1 of MOM of MRC– S&GPS

#### APPROVED:

INTERPLANT MATERIAL RATIONALISATION  
COMMITTEE – MRC(S&GPS)

Rev No.07	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 <sup>st</sup> Issue
Dt:22-02-2014	Dt:	Year:	50 HEP, Bhopal	Corp.R&D	July, 1976

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**5.2.2 Width (IS: 1852):**

Width, mm	Tolerance, mm
Upto & incld. 1250 mm	+ 6 mm - 0 mm
Over 1250 mm & upto and incld. 1550 mm	+ 0.5 percent - 0.0 percent
Over 1550 mm	+ 0.6 percent - 0.0 percent

**5.2.3 Length (Continuous mill) IS: 1852:**

Length, mm	Tolerance, mm
Upto & incld. 2500 mm	+ 25 mm - 00 mm
Over 2500 mm	+ 1 percent subject to a maximum of 70 mm - 0 percent

**5.2.4 Flatness (for cut lengths):**

Thickness, mm	Width, mm	Flatness tolerance, mm
From 2.5 to 4.0	Upto & incld. 1200	15
	Over 1200 & upto incld. 1500	20
	Over 1500	25

**5.2.5 Edge camber IS: 5986:**

The edge camber (i.e. lateral departure of the edge of the material from a straight line forming a chord) of sheets in cut lengths and coil shall not exceed the following values:


**5.2.5.1 For Cut Lengths:**

Length in meters		Tolerance, mm
Over	Upto & incld.	
--	1.25	5
1.25	1.80	6
1.80	2.50	8
2.50	3.15	10
3.15	3.55	12
3.55	4.00	16
4.00	5.00	19

**5.2.5.2 For Coils:**

25 mm in any 5000 mm length.



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**6.0 MANUFACTURE:**

Process of manufacture is left to the discretion of the manufacturer except Bessemer process.

Material shall be manufactured from semi killed or killed steel.

**7.0 FREEDON FROM DEFECTS:**

The sheets shall be free from harmful defects, twists, buckle, rust, scale and waviness and shall be reasonably smooth, flat and square.

**8.0 CHEMICAL COMPOSITION:**

The melt analysis of steel and the permissible variation in the composition of the material from the melt analysis shall be as follows:

Element	Melt analysis, percent, max.	Permissible variation, percent, max.
Carbon	0.15	0.03
Manganese	0.80	0.05
Sulphur	0.040	0.005
Phosphorus	0.040	0.005

**9.0 TEST SAMPLES:**

**9.1 Tensile Test:**

One sample shall be taken per thickness per consignment from each melt.

As far as possible test pieces shall be cut transverse to the direction of rolling and shall be of full thickness of the sheet rolled.

**9.2 Bend Test:**

One sample shall be taken per thickness per consignment from each melt.

Bend test pieces shall be cut so that the axis of the bend is parallel to the direction of rolling viz. transverse.

**Note:** When more than one thickness is rolled from the same melt, one additional test piece for each thickness shall be taken.

**10.0 MECHANICAL PROPERTIES:**

**10.1 Bend:**

When tested in accordance with IS: 1599, the test pieces shall be capable of being bent cold through 180° close. The outer convex surface of the test piece shall be free from cracks.

**10.2 Tensile:**

When tested as per IS: 1608, the test pieces shall show the following properties:

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Tensile strength	: 330 – 440 N/mm <sup>2</sup>
Yield strength	: 205 N/mm <sup>2</sup> , min.
Elongation:	
For sheets up to & Incl. 3 mm, thick	: 20 %, minimum on 80 mm gauge length
For sheets above 3 mm, thick	: 28 %, minimum in 5.65 $\sqrt{S_0}$ gauge length

## 11.0 HARDNESS (VICKERS):

When tested in accordance with IS: 1501, the material shall show a Vickers hardness in the range of 100 – 140 HV.

**Note:** Hardness test shall be conducted only when tensile test cannot be performed.

## 12.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA10113, Rev 07: HOT ROLLED CARBON STEEL SHEET (330 N/mm<sup>2</sup> Tensile)

BHEL Order No,

Supplier's name,

Identification No

Melt No,

Process of manufacture

Details of pickling, descaling and oiling

Results of dimensional inspection

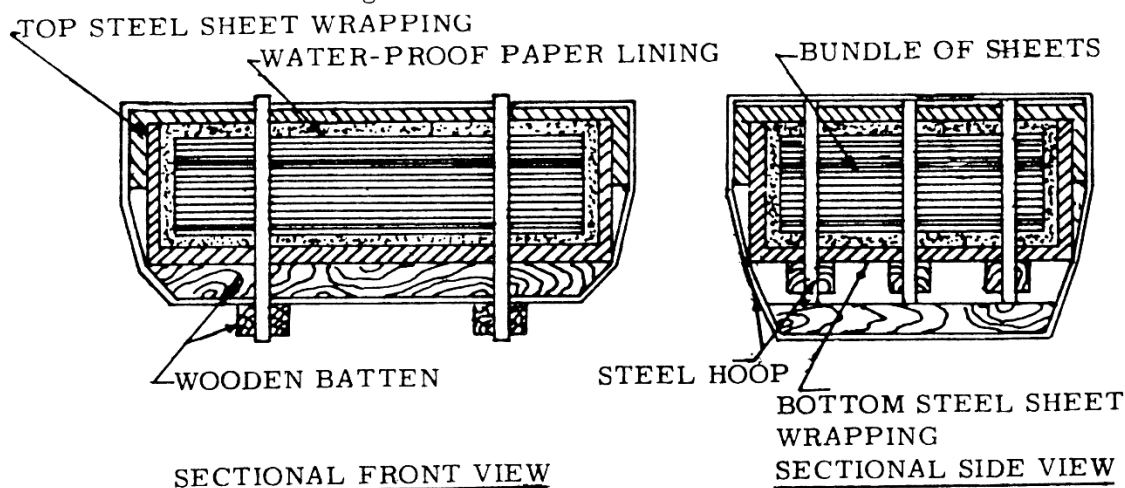
Results of Chemical analysis and Mechanical tests,


**Note:** Material procured, supplied and certified as AA10113 / IS: 5986, Gr.:205 and comply with the requirements of this specification is acceptable.

## 13.0 PACKING AND MARKING:

Steel sheets shall be supplied in bundles and shall be suitably packed in bundles to prevent corrosion and damage during transit.

The recommended packing for imported material shall be as shown below.



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**Note:**

- Water proof paper lining shall be preferably Volatile Corrosion Inhibitor (V.C.I.) Coated Paper with an additional polythene (100 micron) enveloped.
- Approximate weight of each bundle shall be 2 to 3 tonnes. Bundle weighing 2 metric tonnes is however preferred.


A metal label shall be securely attached to each bundle and shall bear the following information:


AA10113:HOT ROLLED CARBON STEEL SHEET (330 N/mm<sup>2</sup> Tensile)  
 BHEL Order No,  
 Supplier's Name & Identification No,  
 Size & Thickness of sheets  
 Weight

**14.0 REFERRED STANDARDS (Latest publications including amendments):**

1) IS: 1154	2) IS: 1501	3) IS: 1852	4) IS: 1599	5) IS: 1608
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<b>COLD ROLLED CARBON STEEL SHEET, ANNEALED - DRAWING</b>					
<p><b>1.0 GENERAL:</b></p> <p>This specification governs the quality requirements of Cold Rolled Carbon Steel Sheet/Coil of drawing quality, Annealed and skin passed condition. Sheets having thickness of 0.40 to 3.15 mm (both inclusive) and widths upto 1250 mm are covered in this specification.</p> <p><b>2.0 APPLICATION:</b></p> <p>Suitable for Drawing/ Welding..</p> <p><b>3.0 CONDITION OF DELIVERY:</b></p> <p>Sheets/Coils : 0.40 mm to 3.15 mm thick, cold rolled, descaled and oiled sheet/coil shall be supplied in fully annealed and skin passed condition. The size, weight and packing of the coils/sheets shall be as agreed to between the manufacturer and BHEL for indigenous material. For imported material, it shall comply with clause 14.0.</p> <p>Sheets shall be supplied in straight lengths or in coils as specified in BHEL order.</p> <p>Sheets shall be flat and the edges cleanly sheared and truly squared to the specified dimensions.</p> <p>Oils used for rust prevention shall be free from pungent smell. The following oils are suggested :</p> <ol style="list-style-type: none"> <li>a) SERVO RP 125 of M/s. IOC.</li> <li>b) RUSTOP 387/388 of M/s. HPC</li> <li>c) Bharat TCPF of M/s. Bharat Petroleum</li> <li>d) Any other TRP conforming to IS : 1154</li> </ol> <p>Sheets shall have a matt surface finish and best surface appearance.</p> <p><b>4.0 COMPLIANCE WITH NATIONAL STANDARDS:</b></p> <p><b>4.1</b> Material shall comply with the requirements of IS:513-1994,                  Gr:D-Drawing, Temper: SP-Annealed &amp; Skin passed;                  Quality; killed/semi killed; Surface type - Best;                  Surface finish : Matt.</p>					
<b>Revisions :</b> <b>Cl. 27.6.8 OF MOM OF MRC-S&amp;GPS</b>			<b>APPROVED :</b> <b>INTERPLANT MATERIAL RATIONALISATION</b> <b>COMMITTEE-MRC (S&amp;GPS)</b>		
Rev. No. 09	Amd.No.	Reaffirmed	Prepared BHOPAL	Issued Corp. R&D	Dt. of 1st Issue JULY, 1976
Dt: 15.06.2005	Dt :	Year :			

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**4.2** Material offered to DIN 1623-1983, Part 1, Gr : RRSt-13.03, (Material No. 1.0347) Surface appearance: Best surface - 05, Surface finish : Matt 'm', is also acceptable.

**4.3** The tolerance on dimensions shall comply with DIN : 1541.

**5.0 DIMENSIONS AND TOLERANCES:**

**5.1 Sizes:**

Cold rolled carbon steel sheets/coils shall be supplied to the dimensions specified in BHEL order.

**5.2 Tolerances:**

The tolerances on sheets and coils shall comply with IS : 513 as detailed below:

**5.2.1 Thickness:**


Tolerances on thickness of sheets	
Nominal thickness, mm	Tolerance for nominal widths upto 1250 mm
-- 0.40	$\pm 0.04$
Above 0.40 up to 0.60	$\pm 0.05$
Above 0.60 up to 0.80	$\pm 0.06$
Above 0.80 up to 1.00	$\pm 0.08$
Above 1.00 up to 1.25	$\pm 0.09$
Above 1.25 up to 1.60	$\pm 0.11$
Above 1.60 up to 2.00	$\pm 0.12$
Above 2.00 up to 2.50	$\pm 0.14$
Above 2.50 up to 3.15	$\pm 0.16$

**5.2.2 Width:**

Width	Tolerance
Upto & Incl. 1250 mm	+ 7 mm
	- 0
Above 1250 mm	+ 10 mm
	- 0

**5.2.3 Length:**

Up to and incld. 2000 mm	+ 15 mm
	- 0
Over 2000 mm	+ 0.75 percent of length
	- 0

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**5.2.4 Camber:**

Camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with a straight line. Camber tolerances are as specified below:

Coils - 20 mm in any 5000 mm length  
Cut lengths - 0.4% x length.

**5.2.5 Out-of Square Tolerance (for cut lengths) :**

1 percent of the width.

(Out-of squareness is the greatest deviation of an edge from a straight line drawn at a right-angle to the other edge of the sheet, touching one corner and extending to the opposite edge).

**6.0 MANUFACTURE :**

Steel shall be manufactured by open-hearth, electric, basic oxygen or a combination of these processes.

Material shall be manufactured from semi killed/killed steel, preferably aluminum killed.

Rimmed steel is not acceptable.

**7.0 FINISH:**

Material shall have a medium or dull finish. Pores, roll marks or scratches which do not impair uniform appearance of the finished product are permissible. The sheets shall be free from waviness and the surface shall be ideal for spray painting.

**8.0 HEAT TREATMENT :**

Sheets and coils shall be fully annealed and skin passed.


**9.0 FREEDOM FROM DEFECTS :**

The material shall be free from harmful defects such as scale, rust, blisters, laminations, pitting, cracked edges, etc.

**10.0 CHEMICAL COMPOSITION :**

The melt analysis of steel and the permissible variation in the composition of the material from the melt analysis shall be as follows:

Element	Melt analysis, percent, max.	Permissible variation percent, max.
Carbon	0.12	0.02
Manganese	0.50	0.03
Sulphur	0.040	0.005
Phosphorus	0.040	0.005

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**11.0 TEST SAMPLES:**

One bend test and hardness test shall be carried out from each lot of 5,000 kg of material or part thereof, per melt per consignment.

Where material of more than one thickness are rolled from the same melt, one additional bend test shall be made for each thickness.

Test pieces shall be cut so that the axis of the bend is parallel to the direction of rolling, viz., transverse direction.

**12.0 MECHANICAL PROPERTIES :**

**12.1 Bend Test :**

The test piece shall be capable of being bent cold through 180<sup>0</sup> close without showing sign of cracks or fracture on the outer convex surface.

Bend test shall be carried out in accordance with IS : 1599.

**12.2 Hardness (VICKERS) :**

When tested as per IS : 1501, the test pieces shall show a Vickers hardness as given below:

Upto & Incl. 1.25 mm, thick	:	115 HV, max.
Above 1.25 mm, thick	:	125 HV, max.

**13.0 TEST CERTIFICATES:**

Unless otherwise specified, three copies of test certificates shall be supplied.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA 101 15, Rev 09/IS:513 Gr:D/DIN 1623 Gr: RRSt 13.03 m,  
BHEL Order No,  
Melt No,  
Size and Quantity,  
Results of Chemical analysis and Mechanical tests,  
Supplier's name,  
Identification No  
TC No,  
Signature of Competent authority, etc..

**14.0 PACKING :**

**14.1 Packing:**

Sheets and Coils shall be suitably packed in bundles to prevent corrosion and damage during transit.

Recommended packing for imported material shall be as shown below. However, other methods of packing is also acceptable if prior agreement of BHEL is obtained in writing by the manufacturer.

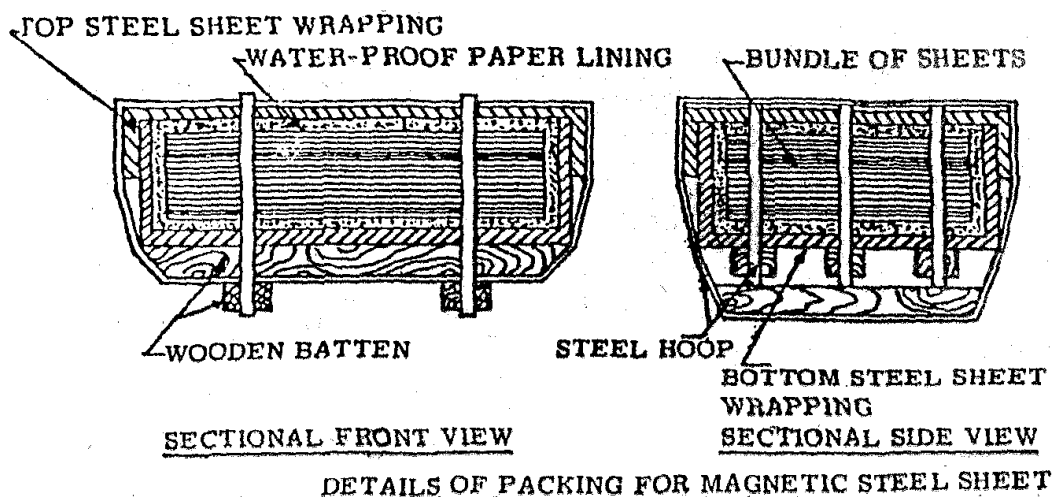


## CORPORATE PURCHASING SPECIFICATION

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14.2 Sheets :Note:

- a) Water proof paper lining shall be preferably Volatile Corrosion Inhibitor (V.C.I.) Coated Paper with an additional polythene (100 micron) enveloped.
- b) Approximate weight of each bundle shall be 2 to 3 tonnes. Bundle weighing 2 metric tonnes is however preferred.

14.3 Coils:

The material shall be supplied in coils of continuous strip. The nominal weight of each coil shall be 1800 - 2000 kg.

The nominal internal diameter of coil shall be 500 mm.

Sheet shall be protected to prevent damage and rusting during transit.

Sheet shall be vertically packed according to the instructions and drawings given below:

- a) An annular protection board shall be placed at either end of the coil.
- b) The coil should then be wrapped with waterproof anti-rust proof paper by lapping axially all around the circumference.
- c) The coil shall then be covered by polythylene sheet or anti-rust waterproof paper and the ends sealed properly.
- d) A galvanized sheet shall be wrapped on the outside of the coil and the top and bottom of the coils. Care shall be taken to ensure that the ends of the top and bottom of the coils extend sufficiently over the inside diameter of the coil.

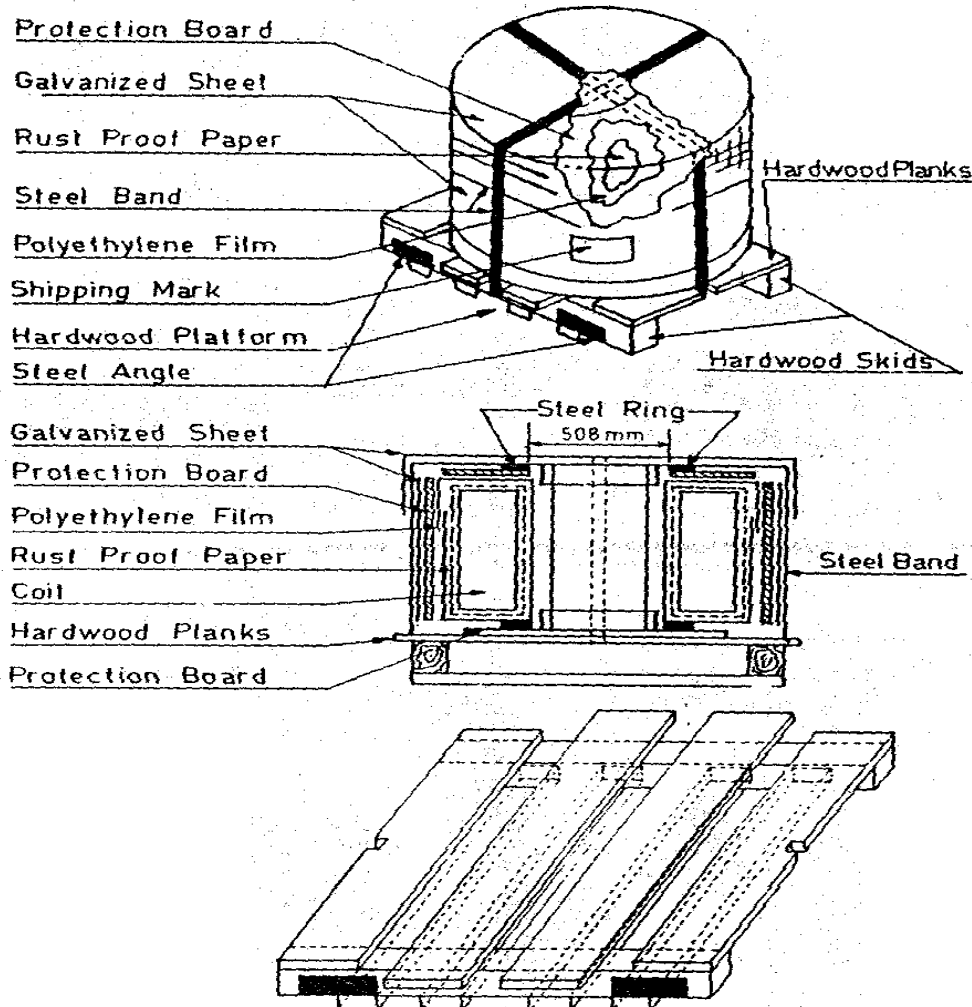


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- e) A galvanized sheet shall be wrapped on the inside of the coil. Care shall be taken that it overlaps sufficiently over the ends of the sheet mentioned in (d) above.
- f) Steel ring made from thick angle sheets shall be placed on the rim of the inner diameter at both ends of the coil. The rings shall be held at either ends at four points by steel bands.
- g) The coil should then be mounted on wooden skids held together by steel bands. Wooden skids must have cutouts to house the steel bands for tight fit and to avoid slippage.
- h) The packing shall ensure that there is no seepage of moisture and the coils reach BHEL in completely rust free condition. It shall be strong enough to withstand handling.
- i) Coils shall be sufficiently tight-wound to prevent collapse to an extent that would preclude their being mounted on a mandrel appropriate to the ordered internal diameter.
- j) Each package should indicate the , Sling Position, for lifting without damage. It is preferable to fix a suitable size of, 'Sheet Steel Angle', at the position where the Sling Rope is to be fitted to avoid slippage/damage/breakage of the wooden skid at four places.



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### 15.0 MARKING:

A metal label shall be securely attached to each bundle and shall bear the following information :

AA 101 15  
 BHEL Order No,  
 Supplier's Name and Identification No,  
 Melt No,  
 Size and Weight.

### 16.0 REFERRED STANDARDS (Latest Publications Including Amendments) :

- |              |               |                       |
|--------------|---------------|-----------------------|
| 1. IS : 513  | 2. IS : 1154  | 3. IS : 1501          |
| 4. IS : 1599 | 5. DIN : 1541 | 6. DIN : 1623, Part 1 |

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### GENERAL INFORMATION FOR CALCULATION (NOT TO FORM ACCEPTANCE CRITERION)

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Tensile strength : 270 - 410 N/mm<sup>2</sup>

Yield strength : 280 N/mm<sup>2</sup>, max.

Elongation on 5.65  $\sqrt{S_0}$  gauge length : 23 percent, min.

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## CORPORATE PURCHASING SPECIFICATION

AA 103 04

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## SPRING STEEL STRIP AND PLATE - ANNEALED

**1.0 GENERAL:**

This specification governs the quality requirements of Spring steel strip and plate, annealed.

**2.0 APPLICATION:**

For manufacture of springs.

**3.0 CONDITION OF DELIVERY:**

**Strips (upto 5mm thick)** : Cold rolled, annealed with polished surface.

**Plates (above 5mm thick)** : Hot rolled, annealed.

Mill edges are not acceptable.

**4.0 COMPLIANCE WITH NATIONAL STANDARDS:**

The material shall comply with the requirements of the following National standard and also meet the requirements of this specification.

**For strips:**

IS : 2507 - 1975 : Cold rolled steel strips for springs

Gr: 6 ( 80C6), annealed

**For plates:**

BS 1449, sec 1.15-1991 : Steel plates, sheet and strips

Gr.:CS 80, annealed

**5.0 DIMENSIONS AND TOLERANCES :****5.1 Sizes:**

Material shall be supplied to the dimensions as specified in BHE L order.

BHEL order shall clearly state, whether the strip shall be supplied in coils or in straight lengths.

**Revisions:**

Cl. 26.6.23 of MOM of MRC-S&GPS

**APPROVED:**

INTERPLANT MATERIAL RATIONALISATION  
COMMITTEE-MRC (S&GPS)

Rev. No. 04

Amd.No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt: 15.01.2004


Dt :

Year: 2013

BHOPAL

Corp. R&amp;D

AUGUST, 1976

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**5.2 Tolerances:**

**5.2.1 Thickness:**

Tolerances on thickness of material shall be as specified below. The thickness of the material shall be measured at a position not less than 10 percent of the ordered width from the edge for widths the position of measurement of thickness higher widths the position of measurement of thickness shall be not less than 10mm from the edge. The variation in thickness of material across the width shall not exceed half the total tolerances given in table -2 of IS:2507 (Refer: Table1 - Annexure).

**5.2.1.1 Tolerance on Thickness:**

**Strips (For thickness upto and including 5mm) :**

Shall comply with Table-2 of IS:2507. (Refer: Table 1 - Annexure).

**5.2.1.2 Plate (for thickness over 5mm upto and including 10mm):**

Shall be  $\pm 5\%$  of the thickness of the plate.

**5.2.2 Width:**

Shall comply with Table-3 of IS:2507. (Refer Table-2, Annexure).

**5.2.3 Flatness (for cut lengths ) of strip:**

Material when supplied shall be reasonably flat. When a 5 metre length of strip is allowed to lie on a flat surface by its own weight, no part of the strip shall lift more than 5 mm from the flat surface. For this purpose, rise should be measured from the flat surface. For this purpose, rise should be measured from the surface nearer to the flat surface.

**5.2.4 Edge camber of strip:**

Edge camber (that is, lateral departure of the edge of the material from straight line forming a chord ) shall not exceed the tolerances given in Table-4 of IS:2507. (Ref:Table 3-Annexure).

**6.0 MANUFACTURE:**

Steel shall be manufactured by the open-hearth, electric, basic oxygen or a combination of these processes. If any other process is employed, prior approval of BHEL shall be obtained.

The material shall be manufactured from killed steel.

**7.0 FREEDOM FOR DEFECTS :**

Steel shall be free from defects such as scale, rust, blisters, laminations, cracked edges, etc.

Decarburisation shall not exceed 3 percent at any point of the material.



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**8.0 CHEMICAL COMPOSITION :**

The melt analysis of steel and permissible variation in the product analysis from the melt analysis shall be as follows:

<u>Element</u>	<u>Melt analysis, percent.</u>		<u>Permissible variation, percent, max</u>
	Min	Max	
Carbon	0.75	0.85	± 0.03
Silicon	0.10	0.35	± 0.03
Manganese	0.50	0.80	± 0.04
Sulphur	--	0.050	+ 0.005
Phosphorus	--	0.050	+ 0.005

**9.0 TEST SAMPLES:**

One sample product shall be taken from each melt for chemical analysis.

For mechanical tests, selection and preparation of samples and test pieces shall be in accordance with IS:3711. Test pieces shall be taken in the rolling direction.

**10.0 MECHANICAL PROPERTIES :**

When tested in accordance with IS:1501, the material shall show a Vickers hardness of 220 HV, max.

**11.0 RESPONSE TO HEAT TREATMENT:**

Material shall be capable of responding to the heat treatment specified below and must achieve a Vickers hardness in the range of 350 – 425 HV.

Harden in oil from a temperature of 780 – 810<sup>0</sup> C.

Temper at a suitable temperature between 430 - 510<sup>0</sup>C .

**12.0 TEST CERTIFICATES :**

Three copies of test certificates shall be supplied, unless otherwise stated on the order.

In addition, to the above, the supplier shall ensure to enclose one copy of the test certificate along with their despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA 103 04, Rev. No. 04: Spring steel strip and plate, annealed

BHEL order No,

Supplier's Reference :

Name


Identification No.

Melt No.

Results of Tests :

Dimensional inspection

Results of Chemical and Mechanical tests.

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**13.0 PROTECTIVE COATING**

The material shall be adequately coated with rust preventive oil/compound.

**14.0 PACKING AND MARKING :**

Strips shall be supplied in coils or in bundles of cut lengths, as specified in the order, in packages each weighing not more than 3,000 kg.

Material shall be packed in water proof-paper of polythene lined hessian cloth and securely tied round with hoop iron and with wooden battens underneath to prevent the material from corrosion and damage during transit.

Plates upto 10mm thick, each pile ( preferably of 16 plates) shall be marked with the following:

A metal label shall be securely attached to each bundle/package and shall be marked with Melt No., AA 103 04; BHEL order No.; Suppliers name/Identification No.; size; weight; etc. on any one corner and encircled with the paint preferably of white colour.

**15.0 REFERRED STANDARDS (Latest Publications Including Amendments):**

1. IS: 1501                      2. IS : 2507                      3. IS:3711                      4. BS:1449, Sec. 1.15



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AA 103 04

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ANNEXURETABLE - 1 (Cl: 5.2.1 & 5.2.1.1)TOLERANCES ON THICKNESSES OF STEEL STRIPS

THICKNESS*, mm	TOLERANCE FOR WIDTHS, mm				
	Up to and including 100	Above 100 Up to and including 125	Above 125 Up to and including 250	Above 250 Up to and including 400	Above 400 Up to and including 650
0.10	±0.01	±0.01	-	-	-
0.15	±0.01	±0.01	±0.02	±0.02	±0.02
0.20	±0.02	±0.02	±0.02	±0.02	±0.03
0.25	±0.02	±0.02	±0.02	±0.03	±0.03
0.30	±0.02	±0.02	±0.03	±0.03	±0.03
0.40	±0.02	±0.03	±0.03	±0.03	±0.04
0.50	±0.03	±0.03	±0.03	±0.04	±0.04
0.60	±0.03	±0.03	±0.04	±0.04	±0.05
0.80	±0.03	±0.04	±0.05	±0.05	±0.05
1.00	±0.04	±0.04	±0.05	±0.06	±0.06
1.25	±0.04	±0.05	±0.06	±0.06	±0.07
1.50	±0.05	±0.05	±0.06	±0.07	±0.08
1.80	±0.05	±0.06	±0.07	±0.08	±0.08
2.00	±0.06	±0.06	±0.07	±0.08	±0.09
2.50	±0.06	±0.07	±0.08	±0.09	±0.10
3.00	±0.07	±0.08	±0.09	±0.10	±0.11
3.55	±0.08	±0.09	±0.10	±0.11	±0.12
4.00	±0.08	±0.09	±0.11	±0.12	±0.13
5.00	±0.09	±0.10	±0.13	±0.14	±0.15

\* When intermediate thicknesses are specified, the tolerance of the next larger thickness step is applicable.

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TABLE-2 (Cl: 5.2.2)

TOLERANCES ON WIDTH							
NOMINAL THICKNESS, mm	TOLERANCE ON NOMINAL WIDTH, mm						
	Up to and Including 100	Above 100 Up to and Including 125	Above 125 Up to and Including 250	Above 250 Up to and Including 320	Above 320 Up to and Including 400	Above 400 Up to and Including 500	Above 500 Up to and Including 600
For Mill Edges:							
0.10 to 5.0	±1.5	±1.6	±2.2	±2.5	±3.3	±4.4	±6
For Sheared Edges:							
0.10 to 0.6	±0.15	±0.2	±0.25	±0.3	±0.4	±0.5	±0.6
0.61 to 1.0	±0.2	±0.25	±0.3	±0.35	±0.45	±0.55	±0.65
1.01 to 2.0	±0.25	±0.3	±0.4	±0.5	±0.6	±0.7	±0.8
2.01 to 3.0	±0.3	±0.4	±0.5	±0.6	±0.7	±0.85	±1.0
Above 3	Subject to agreement						


TABLE - 3 (Cl: 5.2.4.)

TOLERANCES ON EDGE CAMBER					
SPECIFIED WIDTH, mm		SPECIFIED THICKNESS, mm		MAXIMUM TOLERANCE ON EDGE CAMBER IN ANY 2000mm LENGTH, mm	
Over	Up to and Including	over	Up to and Including	Cold-Rolled Unhardened	Hardened and Tempered
-	50	-	2	10	2
-	50	2	-	13	3
50	250	-	2	6.5	2
50	250	2	-	13	3
250	600	-	2	6.5	2
250	600	2	-	13	3



	<h1 style="margin: 0;">CORPORATE PURCHASING SPECIFICATION</h1>	<div style="border-bottom: 1px solid black; padding: 2px;">AA10445</div> <div style="border-bottom: 1px solid black; padding: 2px;">Rev No. 05</div> <div style="padding: 2px;">PAGE 1 of 2</div>			
<h2 style="margin: 0;">HOT FINISHED / COLD DRAWN SEAMLESS CARBON STEEL TUBES FOR HIGH TEMPERATURE SERVICE</h2> <p style="margin: 5px 0 0 0;">ORDERING DESCRIPTION FOR ASME SA192</p>					
<p><b>1.0 GENERAL</b></p> <p>The tubes shall conform to the latest version for ASME SA192 and comply with the following additional requirements.</p> <p><b>2.0 APPLICATION</b></p> <p>For high temperature service at stress levels and temperatures allowed by ASME Boiler &amp; Pressure Vessel Code, Section I &amp; Indian Boiler Regulations.</p> <p><b>3.0 HYDROSTATIC TEST / NDT</b></p> <p>Each length of tube shall be subjected to Hydrostatic test as per ASME SA 450.</p> <p>As an alternative to the Hydrostatic test, each length of tube shall be subjected to NDT as given below:</p> <ul style="list-style-type: none"> <li>a) For thickness up to 3.6mm, inclusive, Eddy current test as per ASME SE309 or for Thickness up to 12mm, inclusive, Flux leakage test as per ASME SE570.</li> <li style="text-align: center; margin: 5px 0;"><b>or</b></li> <li>b) Ultrasonic test as per ASME SE213.</li> </ul> <p>Norms of acceptance shall be as specified in the respective standards mentioned above.</p> <p><b>4.0 INSPECTION AT SUPPLIER'S WORKS</b></p> <p>BHEL's representative shall have free access at all times to all parts of the manufacture's works, until the work on the contract of BHEL is being performed. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with the specification.</p> <p><b>5.0 REPAIR</b></p> <p><b>5.1</b> Repair involving fusion welding is prohibited.</p> <p><b>5.2</b> When defects are repaired by mechanical means, the wall thickness requirements shall be met with and the surfaces shall be smoothly dressed up without any sharp edges.</p>					
Revisions: Cl: 28.2.3 of MOM of MRC – FCF+HTM		<b>APPROVED:</b> INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(FCF+HTM)			
Rev No.05	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 <sup>st</sup> Issue
Dt:01-01-2004	Dt:	Year:2014	68 HPBP, Trichy	Corp.R&D	June, 1978



	<b>CORPORATE PURCHASING SPECIFICATION</b>			AA 107 21	
				Rev. No. 07	
				PAGE 1 OF 4	
<b>STAINLESS STEEL BARS (MARTENSITIC) Gr:X 20 Cr 13, HARDENED AND TEMPERED</b>					
<b>1.0 GENERAL :</b>					
This specification governs the quality requirements of Stainless Steel Bars (Martensitic), Hardened and Tempered.					
<b>2.0 APPLICATION :</b>					
For general engineering purposes involving stresses under corrosive conditions.					
<b>3.0 CONDITION OF DELIVERY :</b>					
Hot rolled and hardened and tempered.					
For size above 100 mm, forgings in H&T condition are also acceptable.					
Bars shall be supplied in the descaled condition.					
The ends of bars shall be square and true.					
The bars shall be supplied in straight lengths without twists and bends.					
<b>4.0 COMPLIANCE WITH NATIONAL STANDARDS :</b>					
The material shall comply with the requirements of the following National standard and also meet the requirements of this specification.					
EN 10088-3, Gr. X 20 Cr 13 : General Purpose Semi-finished Products, Bars, Hardened and Tempered : Rods and Sections					
<b>5.0 DIMENSIONS AND TOLERANCES :</b>					
<b>5.1 Sizes:</b> The bars shall be supplied to the dimensions specified in BHEL order.					
<b>5.2 Tolerances:</b>					
<b>5.2.1 For Forged bars:</b> The tolerances shall be + 8 mm - 0 mm.					
<b>5.2.2 Tolerances on rolled bars shall comply with following specifications:</b>					
EURONORM 58: Hot rolled flats for general purposes					
EURONORM 59: Hot rolled square bars for general purposes					
EURONORM 60: Hot rolled round bars for general purposes					
Tolerances as per equivalent IS Standards are also acceptable					
<b>Revisions:</b> Cl.29.5.0. of MOM of MRC-S&GPS			<b>APPROVED:</b> <b>INTERPLANT MATERIAL RATIONALISATION COMMITTEE-MRC (S&amp;GPS)</b>		
Rev. No. 07	Amd.No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt: 01-9-2007	Dt :	Year: 2013	BHOPAL	Corp. R&D	MAY, 1978

AA 107 21	CORPORATE PURCHASING SPECIFICATION	
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### 5.3 Length :

Unless otherwise specified, hot rolled bars shall be supplied in lengths of 3 to 6 meters or in multiples with maximum of 10% shorts down to 1 meter.

Forged bars shall be supplied in lengths of 1.5 to 3 metres.

### 6.0 MANUFACTURE :

Process used for the manufacture of the bars is left to the discretion of the manufacturer. Material shall be manufactured from fully killed steel. Sufficient reduction and discard shall be made from each ingot to ensure freedom from pipe, harmful segregation and other defects.

### 7.0 HEAT TREATMENT :

The recommended heat treatment is as follows:

Harden in oil / air at temperature of 950-1050°C.

Temper at suitable temperature between 650-750°C.

Details of the actual heat treatment cycle followed shall be specified in the test certificate.

### 8.0 FREEDOM FROM DEFECTS :

The bars shall be free from internal and surface defects. Bars shall be free from twist and bends.

### 9.0 CHEMICAL COMPOSITION :

The melt analysis of steel and the permissible variation in the composition of the material from the melt analysis shall be follows :

Element	Melt analysis, percent		Permissible variation, percent,
	min.	max.	
Carbon	0.16	0.25	- 0.01 + 0.02
Silicon	--	1.00	+ 0.05
Manganese	--	1.50	+ 0.04
Chromium	12.00	14.00	+ 0.20
Sulphur	—	0.030	+ 0.005
Phosphorus	—	0.040	+ 0.005

**Note:** Elements not listed in this table shall not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All appropriate precautions are to be taken to avoid the addition of such elements from scrap and other materials used in production which would impair mechanical properties and the suitability of the steel.



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AA 107 21

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**10.0 TEST SAMPLES :**

The test samples shall be selected as per EN 10088 Part 3.

**11.0 MECHANICAL PROPERTIES :****11.1 Tensile and impact:**

The test pieces shall show the following properties:

Ruling section, mm	Tensile strength, N/mm <sup>2</sup>	Yield strength, min N/mm <sup>2</sup>	Percent Elongation, min	Impact Strength at Room Temperature, ISO – V, Joules	Hardness BHN
Upto 160mm ( Inclusive )	700-850	500	13	25	208-252

**Note:**

1. The mechanical properties required for sizes above 160 mm shall be as per mutual agreement between BHEL and manufacturer.
2. The tensile test shall be carried out in accordance with IS: 1608 or any reputed National Standard.
3. The charpy impact test shall be performed in accordance with IS: 1499 or any reputed National Standard.

An impact test shall consist of three specimens from a single test location, the average value of which shall be as specified above.

Only one value of the three can be below the specified minimum but in no case below 2/3 of the specified minimum value.


- 4 Hardness shall be informed in the test certificates for information.

**12.0 ULTRASONIC TEST:**

- 12.1 Each bar above 100 mm shall be tested ultrasonically in accordance with BHEL standard AA 085 01 18 to ensure freedom from internal defects. The norms of acceptance shall be as per category 2 of the above standard.

**12.2 Optional tests:**

If specified in order, each bar > 40 to 100mm shall be tested ultrasonically in accordance with BHEL standard AA 085 01 18 to ensure freedom from internal defects and the norms of acceptance shall be as per category 2.

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Rev. No. 07		
PAGE 4 OF 4		

**13.0 TEST CERTIFICATES :**

Three copies of test certificates shall be supplied, unless otherwise stated in the order.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

**BHEL References:**

AA 107 21 (Rev. No. 07) : Stainless steel bars (martensitic), Gr: X 20 Cr 13, H&T  
BHEL order No.

**Supplier's References :**

Name  
Identification No.  
Melt No.  
Details of heat treatment.

**Result of Tests:**

Dimensional inspection.  
Results of chemical analysis, mechanical tests and Hardness check called for in this specification.

**14.0 PACKING AND MARKING:**

The material shall be suitably packed in bundles-Hessian wrapped-to prevent sagging and damage during transit.

Each bar/flat 50 mm in diameter/width across flats shall be stamped with 'AA 107 23', melt No., BHEL order No., at one end or on the end face.


Bars bar/flat upto and including 50 mm in diameter/width across flats shall be bundled together and tied with wire at 3 to 4 places along the length of the bars.

A metal label shall be securely attached to each bundle and shall bear the following information :

AA107 21 : Stainless steel bars (martensitic), Gr: X 20 Cr 13, H&T  
BHEL Order No.  
Consignment/Identification No.  
Melt No.  
Size and Weight.  
Supplier's Name.

**15.0 REFERRED STANDARDS (Latest Publications Including Amendments):**

1. EN 10088-3      2. AA 0850118      3. Euronorm 58, 59 & 60

	CORPORATE PURCHASING SPECIFICATION		AA 121 17		
			Rev. No. 03		
			PAGE 1 OF 3		
<h2 style="text-align: center;">HIGH TENSILE BRASS RODS AND SECTIONS (HT-2)</h2> <p><b>1.0 GENERAL:</b> This specification governs the quality requirements of high tensile brass rods and sections.</p> <p><b>2.0 APPLICATION:</b> For drop forging, stamping, machining and general engineering purposes (Switchgear, control gear).</p> <p><b>3.0 CONDITION OF DELIVERY:</b> Cold worked and stressed relieved.</p> <p><b>4.0 COMPLIANCE WITH NATIONAL STANDARDS:</b> The material shall comply with the requirements of the following National standard and also meet the requirements of this specification. IS: 320 – 1980: Specification for high tensile brass rods and sections Gr.: HT - 2 (OTHER THAN FORGING STOCK)</p> <p><b>5.0 DIMENSIONS AND TOLERANCES:</b>  <b>5.1 Sizes:</b> The material shall be supplied as per the dimensions specified in the order.  <b>5.2 Tolerances:</b> Tolerances for round, square, rectangular and hexagonal rods shall be “Normal”, as given in Tables 1, 2, 3 and 4 respectively of IS:2826 : Dimensions and tolerances for copper and copper alloy rods and bars for General Engineering purposes.</p> <p><b>6.0 MANUFACTURE:</b> Cold worked and stress relieved.</p> <p><b>7.0 FREEDOM FROM DEFECTS :</b> The material shall be clean, smooth, free from surface defects, reasonably straight and free from twists.</p> <p><b>8.0 CHEMICAL COMPOSITION:</b> The chemical composition of the material, when analyzed in accordance with IS : 3685 (Methods for chemical analysis of brasses ) or any other conventional/ instrumental methods shall be as follows:</p>					
<b>Revisions :</b> Cl: 20.10.23 of MOM of MRC-NFCW+HE			<b>APPROVED :</b> INTERPLANT MATERIAL RATIONALISATION COMMITTEE-MRC (NFCW+HE)		
Rev. No. 03	Amd.No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt:15-02-06	Dt :	Year :	HARDWAR	Corp. R&D	01-04-78

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Element	Percent, min.	Percent, max.
Copper plus incidental Nickel	56.0	61.0
*Tin	--	1.0
*Lead	0.5	1.5
Iron	0.20	1.5
Manganese	0.50	2.0
Aluminium	0.30	2.0
*Antimony	--	0.02
*Other elements	--	0.5
Zinc		Remainder

**\*Note :** These elements need not be determined when the material conforms with mechanical properties.

## 9.0 TEST SAMPLES:

9.1 One sampling per heat shall be taken for chemical analysis.

9.2 One sample per heat per size shall be taken for other tests.

Material of the same type, size and temper shall be grouped in batches as follows and one sample shall be selected from each batch or part thereof to provide the necessary test pieces :

## 10.0 MECHANICAL PROPERTIES:

### 10.1 Tensile:


When tested in accordance with IS : 1608, the material shall show the following properties. The fractured test piece shall be free from pipes and such other defects.

Size mm	Tensile strength in N/mm <sup>2</sup> , min.	%Elongation on 5.65 $\sqrt{S_0}$ gage length min.
For upto and including 40 mm	520	12.0
Over 40 mm	500	15.0

## 11.0 MERCUROUS NITRATE TEST:

The test shall be carried out on a piece cut from each brass tube selected for testing. When tested in accordance with IS : 2305, the test piece shall not show any sign of cracking. Should any specimen fail under this test, all brass tubes submitted for inspection shall be withdrawn but may be resubmitted for inspection after stress relieving.



	<b>CORPORATE PURCHASING SPECIFICATION</b>	AA 121 17
		Rev. No. 03
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**12.0 RETEST:**

Should any of the test pieces first selected, fail to pass the prescribed tests mentioned under various clauses in this specification, two further samples from the same batch shall be selected for testing, one of which shall be from the same component from which the original test sample was taken, unless that component has been withdrawn by the supplier.

Should the test pieces from both these additional samples pass, the batch represented by the test sample shall be accepted. Should the test pieces from either of these additional samples fail, the batch represented by the test sample shall be rejected.

**13.0 INSPECTION AT SUPPLIER'S WORKS**

Tests and inspection are to be conducted in the presence of the customer's representative. The representative shall have the access at all times while the work on the contract is being performed, to all parts of the manufacture's works. The supplier shall offer the purchaser's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with this specification. The supplier shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his works, the supplier shall make necessary arrangement for carrying out the prescribed test elsewhere.

**14.0 TEST CERTIFICATES :**

The supplier shall submit 3 copies of test certificates along with each consignment.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with there dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

BHEL Order No,  
AA 121 17, Rev 03: High Tensile Brass Rods and sections – HT -2  
Supplier's Reference and Name  
Batch / Heat No.  
Results of chemical analysis, mechanical and all other tests as called for in this specification/ order.  
Consignment / Identification No.


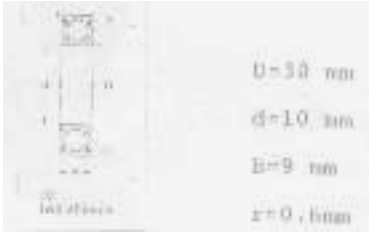
**15.0 PACKING AND MARKING:**


The material shall be suitably packed in crates to prevent corrosion and damage during transit. Each package or crate shall be legibly marked with the following information:


BHEL Order No.  
CPS No.12117: High Tensile Brass Rods and sections – HT -2  
Batch No.  
Identification Mark/No.  
Weight  
Supplier's Reference and Name

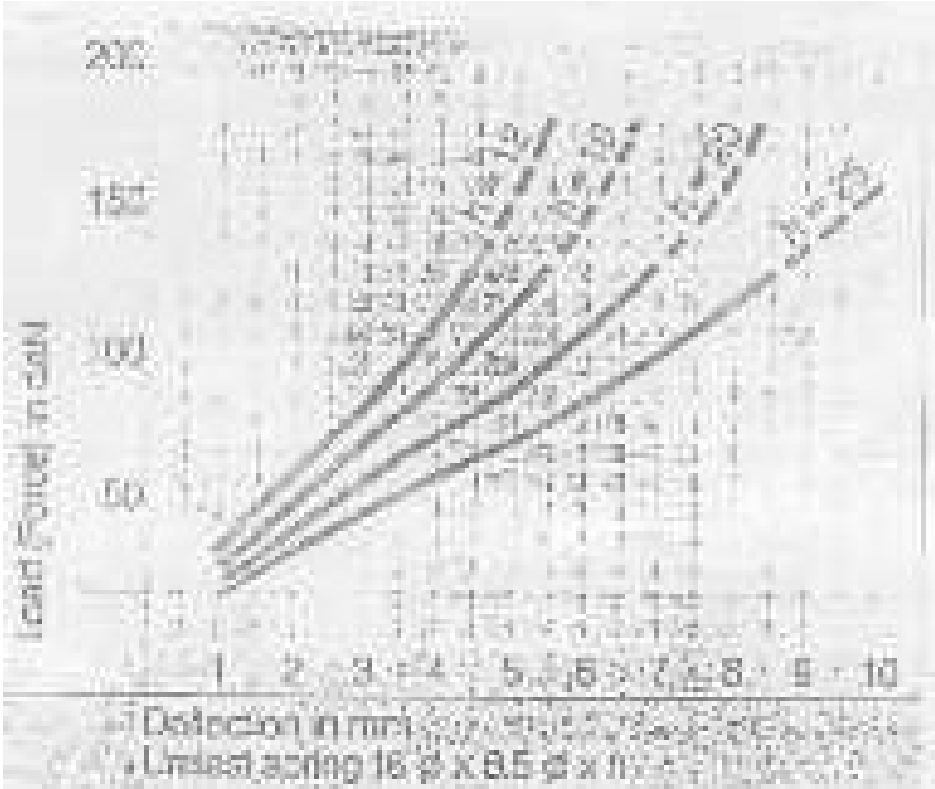
**16.0 Referred standards(Latest publications Including Amendments):**


1. IS:320	2. IS:1608	3. IS:2305	4. IS:2826
5. IS:3685			

			<b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION		SG 12701 REV.01			
					PAGE 1 OF 2			
		<b><u>SPECIFICATION FOR DEEP GROOVE BALL BEARING.</u></b>						
		Drawing No:45211001633 item:001 Style No:ST943272						
		<u>1.APPLICATION:</u>  This deep groove ball bearing is used in spring operating mechanism for Vacuum circuit breakers.It should be practically maintenance free and no lubrication should be required during its service life.						
<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.</div>		<u>2.TYPE:</u>  Deep groove ball bearing(single row)with metal shields on both ends,Type code:6200.2Z						
								
		D=30 mm						
		d=10 mm						
		B=9 mm						
		r=0.6mm						
		<u>3. ACCEPTANCE CRITERION :</u>  - Confirm the markings on the bearing and its dimensions as per the drawing.  - This being a standard bearing item and is procured from approved / reputed / established sources no tests at BHEL are required. Supplier's Test Certificate / Guarantee certificate for originality of the bearing is sufficient for acceptance.						
		REV.	01	PRINTS TO :-		APPROVED –		
		ALTD.	SMM	SWM(P)		VVN		
		APPD.	VR	QCX		PREPARED	ISSUED	DATE
		DATE.	13.10.95	HVD MCD		SMM	RKJ	09.09.93

			<b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION	SG 12701 REV.01
				PAGE 2 OF 2
		<u>3.APPROVED SUPPLIERS:</u>		
		<p>This bearing may be procured from following manufacturers or their authorised dealers:</p> <p>(1) M/S FAG Precision Bearings Ltd. Post:Maneja BARODA –390013 TELEX:0175-280 FAG IN PHONE:43452,42651 -4.</p> <p>(2) M/S SKF Bearings India Ltd. Hoechst House 193,Backbay Reclamation, Nariman Point Post Box No.11525 Bombay -400021 TELEX:011 -2657 SKF B IN PHONE:232244</p> <p>(3) M/S HMT Bearings Ltd. Maula Ali Hyderabad -500040 TELEX:0425 -7030 HMT B IN PHONE:850121</p>		
		<p><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to interest of Co.</p>		

			<b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION		SG 12711 REV.01																															
					PAGE 1 OF 2																															
		<b><u>RUBBER SPRING</u></b>																																		
		<b>1. <u>INTRODUCTION</u> :</b>  The Elastomer spring to drg no. 45211001631 is used in mechanical linkage system between operating mechanism and pole assembly of Vacuum Circuit Breakers. This spring provides advantages of high reliability, very long service life and require no maintenance.																																		
<b>COPYRIGHT AND CONFIDENTIAL</b>  The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.		<b>2. <u>MATERIAL SPECIFICATION</u> :</b>  The spring shall be made of Polyurethan Elastomer having following properties & suitable for high loads.																																		
		- MATERIAL : POLYURETHAN ELASTOMER																																		
		- COLOUR : RED																																		
		- HARDNESS : 90+5 SHORE A (DIN 53505)																																		
		- DENSITY : 1.3 + 0.2 gm / cc																																		
		- CREEP AS A % OF ORIGINAL HEIGHT : 8 TO 10 %																																		
		- PERMISSIBLE DEFLECTION : APPROX. 30% OF ORIGINAL HEIGHT																																		
		- OPERATING TEMPERATURE : -20 DEGREE C TO 80 DEGREE C (120 DEGREE C FOR SHORT PERIOD)																																		
		- LOAD (FORCE) DEFLECTION DIAGRAM : SEE FIGURE.																																		
		- REFERENCE : This spring is equivalent of URELAST SPRING Best. Nr. 1614UB																																		
		<table><tr><td>REV.</td><td>01</td><td colspan="2">PRINTS TO :-</td><td colspan="3">APPROVED –</td></tr><tr><td>ALTD.</td><td></td><td>PD &amp; D</td><td>1</td><td colspan="3">R.K.SHUKLA</td></tr><tr><td>APPD.</td><td></td><td>SWM (PLNG)</td><td>1</td><td>PREPARED</td><td>ISSUED</td><td>DATE</td></tr><tr><td>DATE.</td><td>25.7.2000</td><td>QCX (SCR)</td><td>1</td><td>S.M.M.</td><td>B.P.N.</td><td>7.6.95</td></tr></table>							REV.	01	PRINTS TO :-		APPROVED –			ALTD.		PD & D	1	R.K.SHUKLA			APPD.		SWM (PLNG)	1	PREPARED	ISSUED	DATE	DATE.	25.7.2000	QCX (SCR)	1	S.M.M.	B.P.N.	7.6.95
REV.	01	PRINTS TO :-		APPROVED –																																
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		<div>बीएचईएल</div> <div>BHEL</div>	PRODUCT STANDARD SWITCHGEAR ENGINEERING DIVISION	SG 12711 REV.01
				PAGE 2 OF 2
			<div>LOAD (FORCE) - DEFLECTION DIAGRAM</div> <div></div>	<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.</div>
			<div>3. <u>TEST REQUIREMENTS</u> :</div> <div>Following tests shall be conducted at suppliers works :</div> <div><div>TYPE TESTS</div><div>: Load - deflection characteristic for the first supply.</div></div> <div><div>ROUTINE TESTS</div><div>: For material used, its density and hardness of the spring.</div></div>	
			<div>4. <u>ACCEPTANCE CRITERION</u> :</div> <div><div>(i) TEST CERTIFICATES</div><div>: Supplier shall send test certificates for tests conducted as per para 3.</div></div> <div><div>(ii) TESTS AT BHEL</div><div>: Dimension checks, identification of material used and hardness tests shall be conducted on 2 sample pieces.</div></div>	
			<div>5. <u>IDENTIFICATION MARKINGS FOR TRACEABILITY:</u></div> <div>Supplier may print (no embossing) their firm's logo on the outside cylindrical surface of the spring.</div>	
			<div>6. <u>PACKING</u> :</div> <div>The lot shall be supplied packed suitably for protection against humidity, heat and dust during storage.</div>	

				<b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION		SG 12720 Rev.:02		
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<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.</div>		<b><u>SUPPORT ROLLER'S - SPECIAL NEEDLE ROLLER BEARINGS</u></b>						
		<b>1. INTRODUCTION</b> Support Rollers are special high load carrying capacity needle roller bearings with or without inner rings and are used at critical locations in spring operating mechanism of vacuum circuit breakers.						
		<b>2. CONSTRUCTION</b> Support Rollers consist of an outer ring, an inner ring and loosely fitted needle rollers (no cage is used). The support Rollers without inner ring use special pins over which the needle rollers directly slide.						
		<b>3. APPLICATION :-</b> The bearings are used in VCB mechanism, GVM36 RFT shaft and of PVN12/PVN36 inter phase mechanism. The dimension details are shown in drg. No. 45211001620 for VCB mechanism bearing, 45213030912 for PVN12/36 inter phase mechanism thrust bearing and 45171000577 for GVM36 RFT shaft assembly.						
		<b>4. MATERIALS</b> The outer ring, inner ring or pin and needle rollers are made out of high strength, thorough hardened rolling bearing chrome steels of suitable grades: Finished needle housings, inner ring and needles (duly hardened and ground) shall have hardness of 670 to 840 HV (58 to 65 HRC). Hardness depth shall be min 0.3 mm after grinding. Surface finish of all rolling elements shall be Ra 0.2 microns.						
		<b>5. OPERATING TEMPERATURE RATING</b> The operating temperature range required for the spherical rod ends is - 20 <sup>0</sup> C to 120 <sup>0</sup> C.						
		<b>6. LOAD RATINGS</b> The basic load capacity and Radial load ratings (static and dynamic) are as mentioned on item drawing. At loads up to the magnitude of the static load rating no permanent deformation should develop in the sliding surface parts. Also no increase in friction or seizing of the surfaces in sliding contact should occur.						
		<b>7. DIMENSIONS</b> The dimensions of the support roller shall be as per item drawing.						
		<b>8. TEST REQUIREMENTS</b> Following checks / tests shall be conducted at the supplier's works :  - Dimension checks as per drawing. - Test to verify materials used and process followed. - Testing the static load rating (Co) (Refer para 6)						
		REV.	02	PRINTS TO :-		APPROVED –		
		ALTD.	NB	QCX	1	R.K. SHUKLA		
		APPD.	RKS	PD&D	1	PREPARED	ISSUED	DATE
		DATE.	08/07/2000	SWM(PLNG)	1	SMM	RAJESH	17-07-1995

		<div><div>बीएचईएल</div><div>BHEL</div></div>	PRODUCT STANDARD SWITCHGEAR ENGINEERING DIVISION	SG 12720 Rev.:02
				PAGE 02 OF 02
		<div>9. ACCEPTANCE CRITERION</div> <div>SUPPLIERS CERTIFICATE: Supplier shall send test certificate of meeting the requirements outlined in Clause 8 with each lot of supply for acceptance.</div>		
<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.</div>		<div>10. TESTS AT BHEL:</div> <div>For supplies from reputed bearing manufacturers / established sources such as M/s FAG, M/s SKF, M/s INA &amp; M/s NRB no tests at BHEL are advised. In such cases, he supplier's Test Certificate / Guarantee certificate for originality is sufficient for the acceptance of the item.</div> <div>However for supplies from new sources following quality checks are recommended:</div> <div><div>- Dimension checks as per drawing.</div><div>- Surface hardness and its depth check.</div><div>- Checking the static load capacity (Radial)</div></div> <div>For this purpose the support roller shall be mounted as shown below and load applied in radial direction.</div> <div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div>DIRECTION OF STATIC LOAD</div><div>PIN</div><div>ADAPTOR</div><div>SUPPORT ROLLER ASSY.</div></div> <div><div>Observations during static load testing shall be as per clause 6.</div></div> <div>11. IDENTIFICATION MARKINGS</div> <div>Supplier's name /logo and item designation shall be engraved / punched on the side face of the outer ring of the support roller.</div>		
		<div>12. PACKAGING</div> <div>These support rollers are having loosely fitted needles, hence shall be packed appropriately against loss of needles / inner rings / pins and protection against damages due to atmospheric effects.</div>		