Pre-Qualifying Criteria

The following documental evidences to be provided to qualify for the tender

SN	DOCUMENTAL EVIDENCE TO BE PROVIDED	Vendor's confirmation
1	The vendor should be a **manufacturer/trader** and should have completed supply of hardened rolls (not less than 45 HRC) to any of steel rolling mills in Central/State/Govt organisation/PSU Company/ Public Listed company. **Purchase order copy for Supply of hardened rolls** (not less than 50 HRC) to any of **Steel Rolling Mills** in Central/State/Govt organisation/PSU Company/ Public Listed company after March 2017.	Submitted/Not Submitted
2	For Manufacturer **the required facilities at his works as per TDC requirement** for carrying out the job	Submitted/Not Submitted
3	For Trader **valid technical tie up** with the facility owner and **the required facilities as per TDC requirement** for carrying out the job	Submitted/Not Submitted
4	**Supply completion proof** (Delivery Challan/Tax Invoice/Payment Proof /Performance certificate) for the above Purchase order.	Submitted/Not Submitted
5	**Test certificate of the hardened Rolls** supplied from Central Govt/ State Govt/ NABL/ILAC accredited lab for the above Purchase order.	Submitted/Not Submitted

Without submission of Documental Evidence of the above, vendor offer shall be liable to rejection.

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Record of revision	07 – Clause 3.1,3.2 & 3.3 modified w.r.t Forging, UT and TC for raw material Clause 7.0 Forging acceptance details added Clause 7.1.1 & 7.1.2 Tensile & hardness test details added Clause 7.2.1 Liquid penetrant test & acceptance details added Clause 9.0 report requirement details added In Table A, tensile test piece details added 08 – Clause 3.1- 3.3 modified as 3.1 – 3.5; Clause 4.0 modified 09 – Drawing No. 20.St.192.02.238 added in clause 1.0 for higher dia. roll.

1.0 PRODUCT:

Sl.No.	Equipment / Product	Drg. No.	Drg. Rev. No.
1.	Push Bench Fixed Rolls	20.ST.192.01.158	AS PER LATEST ENQUIRY / PURCHASE ORDER
2.	Push Bench Adjustable Rolls	20.ST.192.02.159 20.ST.192.02.238	

2.0 APPLICATION:

Used in Push Bench Stands for hot rolling of tubes in Temperature 1100-1200 Deg.C. and subjected withstand 60T - 120 T force (impact load), with cyclic heating and cooling.

3.0 MATERIAL:

DIN 1.2365 - X32CrMoV33

3.1 Raw material is to be forged to ensure uniformity of structure & strength with reduction ratio in cross section area of 4:1 from ingot to final forging, close to final shape and size. The forging shall be made as disk / ring forging so that the flow lines are oriented parallel to the circumference. The forging supplier shall furnish TC clearly indicating the size of ingot (cross section X length) used and the forging reduction ratio achieved. Forging shall undergo post forge **Stress Relieving at 650 degree C for 24 Hrs.** with furnace cooling and further **Spherodizing Annealing at 800 degree C for 20 – 30 Hrs.** and cooled in furnace.

3.2 The ingot for the above forging shall be made with any one of the following:
Melting process : Electric Arc Furnace / Induction Furnace **and**
Refining : Vacuum De-gassing / Electro Slag Refining.

3.3 Inclusion rating shall be as per **ASTM E45**
1. Thick series 0.5 allowed. 2. Thin series 2 max.
3. Grain size shall be 6 or finer.

3.4 Ultrasonic testing shall be done on the forging after proof machining in accordance with **SA 388**. Acceptance Standard in accordance with Clause **3.3.4.2 of ASME Sec VIII Div.2**. Test shall be certified by **NDT Level II** qualified personnel as per **SNT-TC-1A** (Society for Non destructive Testing)

3.5 The ingot & forging supplier shall provide
Original mill Test Certificate (TC) for the Material Chemistry **(or)**
Copy of mill TC and NABL accredited Lab Test Report for Material Chemistry in original.

4.0 HEAT TREATMENT:

As per Table-A furnished in page 3. The temperatures shown are indicative which can be modified as necessary to achieve the specified mechanical properties.

5.0 DIMENSIONS AND TOLERANCE:

As given in the Drawing

6.0 DIMENSIONAL INSPECTION:

Dimensional inspection shall be carried out by the supplier - Acceptance as per drawing

7.0 INSPECTION & TESTING:

Forging details (refer clause 3.1 - 3.5) is to be submitted to BHEL and got approved before the start of proof machining.

7.1 MECHANICAL TESTING :

7.1.1 Tensile Test is to be done on test piece as per **DIN 50145.** Acceptance as per Drawing

7.1.2 Hardness Test is to be done on job & test piece as per **DIN EN ISO 6508-1**. Acceptance as per Drawing.

7.2 NON-DESTRUCTIVE TEST :

7.2.1 Liquid Penetrat Test :

To be done after finish machining as per **ASTM E165** and shall be certified by **NDT Level II qualified personnel as per SNT-TC-1A.**

Acceptance standards : All surfaces to be examined shall be free of,

1. Relevant linear indications,
2. Relevant rounded indications greater than 3/16 inch (5 mm)
3. Four or more relevant rounded indications in a line separated by 1/16 inch (1.5 mm) or less, edge to edge.

8.0 MARKING:

Shall be done as given in the drawing

9.0 TEST CERTIFICATE/REPORT:

Following test certificates /reports shall be sent with materials. In all the TCs & reports BHEL PO No., Component Name, TDC NO. and Drawing No., Material Identification No (heat/melt no), Job Sl. No. shall be mentioned where ever applicable:

1. Raw Material Chemistry – Clause 3.5
2. Ultrasonic Test Report for Raw Material – Clause 3.4
3. Hardness & Tensile Test - Clause 7.1.1 & 7.1.2
4. Temperature-Time-Recorder Graph for the Heat Treatment Cycle followed (Table A)
5. Liquid Penetrant Test – Clause 7.2.1
6. Dimension Report – Clause 5.0

10.0 PRESERVATION & PACKING :

1. Supply with rust preventive coating which shall be dry after application and removable by common solvents.
2. Pack suitably to avoid transit & handling damages

TABLE – A

Rolls shall be heat-treated as per the following procedure.

Sl.No.	Process	Detail
1.	Stress Relieving	650–675 Deg. C . Hold for 1 Hour / 25mm of thickness Cool in Furnace upto 400 Deg. C and then Air-cool.
2.	Hardening – I Preheat	Charge during Furnace Temp. at 250 Deg.C. Raise Temp. to 540 – 650 Deg.C Rate of heating – 110 Deg.C per hour Hold for 1 Hour / 25mm of thickness of material.
3.	Hardening – II Preheat	845 – 870 Deg.C. Rate of heating – 110 Deg.C per hour Hold for 1 Hour / 25mm of thickness of material
4.	Austenising	1010 – 1040 Deg.C Soaking 15 – 40 min. in Salt Bath
5.	Quenching	596 – 650 Deg.C. Salt Bath Hold for 30 minutes After Temp. equalization – cool in Air.
6.	Alternate Quenching	After soaking – quench in Air
7.	Quenched Hardness	56 – 59 HRC
8.	First Tempering	Immediately after reaching 50 Deg.C – Temper to 525 – 550 Deg.C. Hold for 1 Hour / 25mm thick of materials Air Cool.
9.	Second Tempering	Temper to 600 – 620 Deg.C. Hold for 1 Hour / 25mm thick of materials Air Cool.
10.	Third Tempering	Temper to 580 – 600 Deg.C. Hold for 1 Hour / 25mm thick of materials Air Cool.

Tensile Test piece as per **DIN 50125 - A10 X 50** (Refer Page 3, Clause 4.2, Table 2 of DIN 50125) made from a test coupon heat treated in the same heat treatment batch of the P B Rolls shall be prepared to carry out the tensile test as given in **Clause 7.1.1**

Prepared By	Reviewed By	Approved By
SR. ADDL ENGR / TE	SM / QA&C	MANAGER / TE

BHEL, Tiruchirapalli-620014	SSTP / Tool Engineering	Technical Delivery Conditions

Product : SRM ROLLS

Document No.	Revision No.	Effective Date	Page No.
TDC/TE/MFG- 06	04	26.08.2010	1 of 2
Revision Record	04 – Clause 3.4 : modified Clause 7.1 : liquid penetrant test details added Clauses 6.0 – 11.0 rearranged & renumbered to 6.0 – 10.0 Clause 8.0 : modified		

1.0 PRODUCT:

Sl.No.	Equipment / Product	Drg. No.	Drg. Rev. No.
1.	Steel Roll SRM 300	20.ST.115.02.160	AS PER LATEST ENQUIRY / PURCHASE ORDER
2.	Steel Roll SRM 380	20.ST.115.01.157	

2.0 APPLICATION:

Used in Stretch Reducing Mill Stands - for Hot Rolling of Seamless Steel Tubes in Temperature 850 - 900 Deg.C

3.0 MATERIAL:

1. **DIN 1.2201 – X165Cr.V12** (OR) **SAE J438(70) D2** (OR) **IS:3748-1990 XT160Cr12**
2. Conduct Ultrasonic Test on Raw Material after proof machining in accordance with SA 388.
3. Acceptance Standard in accordance with AM 203.2(c), ASME Sec VIII Div.2.
4. Chemistry : As per drawing
   Original mill test certificate shall be provided. Otherwise copy of original mill test certificate and test report from **NABL accredited lab** for chemical check on sample from the procured material shall be provided.

4.0 DIMENSIONS AND TOLERANCE:

Shall be as per Drawing

5.0 HEAT TREATMENT:

Sl.No.	Process	Detail
1.	Stress Relieving	650-705 Deg.C 2 Hours / 25mm Soaking Slow cooling to 500 Deg.C Air Cool
2.	Hardening	980-1025 Deg.C 1 Hour / 25mm Soaking
3.	Oil Quenching	80 Deg.C (Servo Quench 11)
4.	Tempering – I	470-580 Deg.C 3-4 Hrs. Soaking Air Cool to Hand-warm Temperature (about 50 Deg.C)
5.	Tempering – II	530-550 Deg.C 1 Hour / 25mm Soaking

6.0 INSPECTION & TESTING:

6.1 DIMENSIONAL INSPECTION :

Dimensional inspection shall be carried out by the supplier and report for the same shall be sent along with the supplies – Acceptance as per drawing.

Air gap to be checked using template and the same shall be given by SSTP/BHEL on placement of order

6.2 MECHANICAL TESTING:

1.Hardness Test as per **DIN EN ISO 6508-1** FOR X165CrV12 - Acceptance as per Drawing.
2.Hardness Test as per **SAE J438(70)** for D2 - Acceptance as per Drawing.
3.Hardness Test as per **IS:3748-1990** for XT160Cr12 - Acceptance as per Drawing.

7.0 NON-DESTRUCTIVE TEST :

7.1. Liquid Penetrat Test :

To be conducted on entire surface after finish machining as per **ASTM E165** and shall be certified by **NDT Level II qualified personnel as per SNT-TC-1A.**

Acceptance standards : All surfaces to be examined shall be free of,

1. Relevant linear indications,
2. Relevant rounded indications greater than 3/16 inch (5 mm)
3. Four or more relevant rounded indications in a line separated by 1/16 inch (1.5 mm) or less, edge to edge.

8.0 TEST CERTIFICATE/REPORT :

Following test certificates shall be sent with Materials.
PO No., component name, TDC NO. and drawing no. shall be mentioned where ever applicable.
Traceability data like Heat / Melt No. & job Sl. No. shall be provided in all the reports.

1. Raw Material Chemistry **(Clause 3.4)**
2. Hardness **(Clause 6.2)**
3. Temperature-Time-Recorder Graph for the Heat Treatment Cycle followed
4. Ultrasonic Test Report for Raw Material **(Clause 3.2 & 3.3)**
5. Liquid Penetrant Test **(Clause 7.1)**
6. Dimension Report **(Clause 6.1)**

9.0 MARKING:

The marking shall be done on the job as shown in the Drawing.

10.0 PRESERVATION & PACKING :

1. Supply with rust preventive coating which shall be dry after application and removable by common solvents.
2. Pack suitably to avoid transit & handling damages

Prepared By	Reviewed By	Approved By
DM / TE	DGM / QA&C	AGM / TE