



# PRODUCT STANDARD

## PULVERISERS

### HYDERABAD

Product  
STD no.

BA35026

Rev No. 00

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## GRINDING ELEMENTS FOR BHEL XRP/HP BOWL MILLS

### 1.0 GENERAL:

This specification governs the procurement of grinding elements consisting of Grinding Rolls and matching Bull Ring Segments for Operation & Maintenance (O&M) spares. The guaranteed wear life (GWL) is applicable as per variant Table-A meeting the technical requirements / performance requirements for the XRP/HP Bowl Mills.

### 2.0 QUALIFYING REQUIREMENTS

The bidder shall satisfy the following minimum qualifying requirements by submitting documentary evidences along with the technical offer, failing which the offers shall be summarily rejected.

#### 2.1 Proven Experience (Documentary evidence to be submitted)

Evidence of the established performance of wear life of minimum 8000 hours (without repair or rebuild of the wear area) for 28" to 72" size Grinding Rolls with matching bull ring segments.

The above should be for XRP 623 to HP 1203 type BHEL make or other similar design (Raymond Mill) coal mills for power plant applications with typical high ash Indian coal as given in Annexure I.

2.1.1 Bidder should have supplied minimum of 13 sets of Grinding rolls & Bull ring segments in the above range in India and must have achieved a proven life of 8000 hours under the coal condition of Annexure I, under following conditions

2.1.1.1 Size Distribution (Rolls) : At least

- 4 Sets (out of 13 Sets) should be from 42" and above.
- 4 Sets (out of 13 Sets) should be from 37" and below.

2.1.1.2 From four different sites

2.1.1.3 Located at least at two (out of five) geographically different locations (North/East/South/West/Central)

2.1.1.4 Preferably with coal from different collieries.

2.1.1.5 Data from last five years from the date of issue of the present enquiry.

2.1.1.6 The evidences shall be submitted in the following format.

Name of Site	Mill type	Size of grinding roll	Date of supply	Life achieved in hrs.	Coal Type as Per Annexure I
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2.1.2 Bidder should have capacity to manufacture rollers of size up to 72".

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## 2.2 Manufacturing facilities and proven process:

2.2.1 Vendors to note that at present BHEL is using the Grinding elements as per the following details:

Rolls and Bull ring segments manufactured using the proven process of sinter cast. The Insert of the rolls are made up of hard metal matrix composite, of high chrome iron having following Chemical composition:

C = 2.5-3.4 %, Cr = 18.0-27.0 %, Mo= 0.5-1.3 %, Ni-0.3-1.3%,

Mn = 0.5 - 1.5 %, Si = 1.0 % max., S-0.1% Max, P-0.1% Max

This High-Chrome alloy is reinforced with ceramic particles, evenly distributed. The hardness of inserts is in the range of 58 – 66 RC.

These inserts are embedded into a base metal, which is either ductile iron (SG iron) / Hi-Chrome / any other equivalent material, forming a roll by Static / centrifugal process with overall dimensions as per BHEL drawing.

The Chemical composition of SG iron: C- 3.2-3.5%, Si-2.5-3.0%, Mn-0.3% max. Mg-0.04 - 0.07%.

Any bidder following the above manufacturing process will be qualified, subject to meeting the clause 2.1.

However, the above Chemical Composition/Process/ technology do not absolve the supplier from guarantee responsibility. The Heat treatment procedure shall be established by the vendor and shall be indicated in Quality Plan.

### 2.2.2 ANY OTHER PROCESS FOLLOWED & MEETING 2.1

In case the bidder having a manufacturing process different from 2.2.1, the bidder shall have all the necessary facilities for the manufacture of Grinding rolls and bull ring segments. The process used for manufacture shall be a proven one (meeting the requirements of the clause 2.1) and the evidences as submitted shall be for the same process of manufacture. Bidder shall submit details of their manufacturing facilities.

In case any of the sub-process is out sourced / subcontracted, the tie-up letter with the agency along with details of their facilities and capabilities shall also be submitted for acceptance by BHEL.

**The information given by the bidder is liable for evaluation by BHEL.**

2.2.3 **Traders / stockists / mediators are not allowed to quote. Only manufacturers who are having relevant facilities, proven process and experience will be considered for the supply.**

## 2.3 Infrastructure for providing Technical Services

Bidder shall have the sufficient infrastructure in India for after sales services to monitor performance with respect to wear life, output, fineness, coal characteristic etc. Confirmation for the same shall be submitted.

## 3.0 MATERIAL CODE: See Table

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#### **4.0 QUANTITY REQUIRED PER MILL**

- 1) 3 Nos. Grinding Rolls.
- 2) 1 set of matching Bull Ring Segments.

#### **5.0 GRINDING ROLL & BULL RING SEGMENTS:**

- 5.1** Dimensions: The overall dimensions of the Grinding Roll and Bull Ring Segments shall be as per BHEL Drawings.
- 5.2** A detailed manufacturing process (along with the process control parameters) and manufacturing and test facilities data shall be submitted for review by BHEL.
- 5.3** Material used for the manufacture of the Grinding rolls and Bull ring segments shall be specified along with the technical details. The specifications shall be submitted for acceptance by BHEL. The details of the patented portion of the technology need not be provided, however the generic name of the proven patented technology along with the broad details shall be provided.
- 5.4** A Quality plan with stage wise inspection and acceptance criteria shall be submitted for approval by BHEL and/or customer.

#### **6.0 INSPECTION:**

- 6.1** The inspection of items will be as per the approved Quality plan (refer clause 5.4).
- 6.2** Inspection of the material will be based on the applicable process of manufacture acceptable to BHEL. The tests like chemical composition, microstructure, hardness and NDT etc. as applicable will be part of the approved Quality plan.
- 6.3** The overall dimension of the grinding roll, bull ring segments and any other component/item of the package shall be as per BHEL drawing.
- 6.4** The Bull ring Segments shall be assembled in Check Bowl. After assembling of the segments, final gap should not be more than 20 mm. The drawing for the check Bowl and the arrangement for segment assembly on Check Bowl shall be furnished by BHEL.
- 6.5** The number of Segments i.e. Plain, Half, Quarter, Keyed & Shim for each size of the mill shall be shown on Check Bowl drg. However, additional shims/ segment to fill the gap up to 20 mm shall be supplied by the vendor which may be required at site during assembly.

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#### **7.0 GUARANTEES:**

- 7.1 Wear Life:** The minimum guaranteed wear life (GWL) shall be As per Tables attached as per variant Table-A for the typical coal with the shale and sand stone content of coal may be as high as 20% with alpha quartz contamination up to 5.0 mm size. The applicable GWL is with YGP index of 80. Refer Annexure-I and the curve provided in Figure 1.
- 7.2** Notwithstanding anything mentioned elsewhere in the specification, the supplier shall give back-to-back guarantee as applicable for each of BHEL customer for wear life of grinding elements as per terms and conditions of customer contract.
- 7.3** Consistency in mill output to minimum 90% of the rated capacity and pulverized fuel fineness of minimum 70% through 200 mesh and 99% through 50 mesh at the end of guaranteed wear life. Supplier shall prove the Mill capacity & performance with originally installed worn out Grinding elements after the GWL for establishing the same along with BHEL team.
- 7.4** Failure due to manufacturing defects (generally leading to breakage/ catastrophic failure of grinding elements) shall be replaced and installed immediately.

#### **8.0 INSPECTION AT SUPPLIERS WORK**

Tests and inspection are to be conducted in the presence of BHEL/ customer representatives as per approved Quality plan. The representatives shall have free access at all times while the work on the contract is being performed. The supplier shall offer all the tools and tackles required for inspection to the inspection agency.

#### **9.0 TEST CERTIFICATE:**

All the rolls shall be identified with a serial number punched. The Bull ring segments set shall be numbered by paint for each set. Supplier shall supply 3 copies of Test certificates with following information for rolls and bull ring segments.

1. BHEL order number
2. Supplier's reference and name.
3. Heat No. / Roll no.
4. Results of chemical analysis, Hardness Test and all other tests or any other tests as per approved QAP
5. Drawing no., Material Code
6. Consignment/ Identification no.

#### **10.0 DOCUMENTS**

- 10.1** Three Copies of test certificates are to be provided.

#### **11.0 PACKING:**

All components are to be suitably packed set wise to prevent Corrosion and damage during transit. Machined/ Ground surfaces shall be properly protected with suitable anti-corrosive compound. Each package shall be legibly marked with following information.

1. BHEL Order No.
2. Consignment/ Identification No.
3. Roll No./ Set No.
4. Drawing no., Material Code
5. Weight in Kg
6. Suppliers Name

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#### **12.0 SUPERVISION & SERVICES:**

- 12.1** Personnel for supervision for Erection and commissioning shall be deputed within a period of one week from the notice given by BHEL.
- 12.2** Mill performance shall be monitored for the guaranteed period and supplier shall visit the site periodically (approximately after every 2000 hours of operation) and record the grinding elements wear life along with BHEL/ CUSTOMER.
- 12.3** Coal quality (including rejects) shall be monitored for the guaranteed period and supplier shall visit the site periodically and record the coal quality along with BHEL/ Customer. In case BHEL is not able to visit site periodically, vendor will be given clearance to visit site on his own to monitor & record coal quality. The data so collected and visit report shall be submitted to BHEL.
- 12.4** Supplier shall prove the Mill performance as per clause 7.3.

#### **13.0 GENERAL:**

- 13.1** BHEL assume/understand that the metallurgy used by the bidder shall vary for the guaranteed wear life even though the envelope dimensions (consequently, the volume) remains same.
- 13.2** This specification is prepared for the specified minimum guaranteed wear life (GWL). In case the coal quality differs, the guarantee shall be mutually discussed and supplier shall confirm the same to enable BHEL to execute such contracts with its customer(s). Customer tender conditions shall be binding in all cases.
- 13.3** In case, the Supplier finds that there is a need to improve the grinding elements metallurgy/technology to meet the GWL, the same shall be supplied without any cost implication to BHEL. In no case, an inferior metallurgy/technology shall be supplied than what had been offered during evaluation for establishing the provenness.

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**Guaranteed Wear Life (GWL) : 8000 Hours @80 YGP (Refer curve Figure 1)**

**TABLE-A, FOR MATERIAL CODE**

Var No.	Mill Type	Item Description	Drawing No.	Matl. Code	Metal Volume ( cm <sup>3</sup> )
01	623 XRP	Grinding rolls 28"	16106200253		77824.00
02	623 XRP	Bull ring segment set	16116201261		77306.67
03	803 XRP 803 HHP	Grinding rolls 37"	26108000515		158586.67
04	803 XRP	Bull ring segment set	26118000286		165316.67
05	803 HP	Grinding rolls 46"	46108090204		184893.33
06	803 HHP 803 HP	Bull ring segment set	26118001105		191890.67
07	883 XRP	Grinding rolls 43"	26108802325		209693.33
08	883 XRP	Bull ring segment set	26118802336		177893.33
09	703 HP	Grinding rolls 42"	26107090118		178106.67
10	703 HP	Bull ring segment set	26117001080		124286.67
11	703 XRP	Grinding rolls 32"	26107002451		86893.33
12	703 XRP	Bull ring segment set	26117090134		132854.67
13	663 XRP	Grinding rolls 29"	26106601311		57440.00
14	663 XRP	Bull ring segment set	26116601356		102205.33
15	963 XRP	Grinding rolls 48"	26109603696		302430.00
16	1003 XRP	Grinding rolls 50"	16100090057		265822.67
17	963 XRP 1003 XRP	Bull ring segment set	26110090116		232052.33
18	1103 XRP	Grinding rolls 62"	16100401317		345200.00
19	1103 XRP	Bull ring segment set	26110402603		268671.33
20	HP 1103	Grinding rolls 62"	26111002902		328564.00
21	HP 1103	Grinding rolls 62" (Small Bore)	26101003169		407141.33
22	HP 1103	Bull ring segment set	16111001564		271726.67
23	HP 1203	Grinding rolls 72"	26112002903		613617.33
24	HP 1203	Bull ring segment set	16112001565		320601.33

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**ANNEXURE – I**

**TYPICAL COAL ANALYSIS (INDIAN COAL):**

Parameter	Unit	Coal Analysis Data (as available)					
		Coal 1	Coal 2	Coal 3	Coal 4	Coal 5	Coal 6
<b>Proximate Analysis (as recd)</b>							
Moisture	%	18	14	18	16	15	15
Ash	%	46	45	38	45	45	45
Volatile Matter	%	16	20	20	19	20	19.5
Fixed Carbon	%	20	21	24	20	20	20.5
<b>Hard Grove Index</b>							
		45	47	60	50	47	42
<b>Abrasion Index (YGP)</b>	mg steel/ kg coal	85	80	80	80	80	80
<b>Ash Analysis (as recd)</b>							
Silica (SiO <sub>2</sub> )	%	64.86	62.4	59.79	59.54	62.5	59.6
Alumina (Al <sub>2</sub> O <sub>3</sub> )	%	23.8	27.31	25.36	29	27.3	30.75
Iron Oxide (Fe <sub>2</sub> O <sub>3</sub> )	%	6.52	4.96	7.2	6.42	4.9	6.5
Balance	%						

**Remark:**

- The shale and sand stone content of coal may be as high as 20% with alpha quartz contamination up to 5.0 mm size. The effect of these shale, sand stone and alpha quartz content shall be considered for wear life guarantees of Mill wear parts.
- In cases where, YGP index values are not available;  $\alpha$ -quartz content of up to 25% may be considered for reference.

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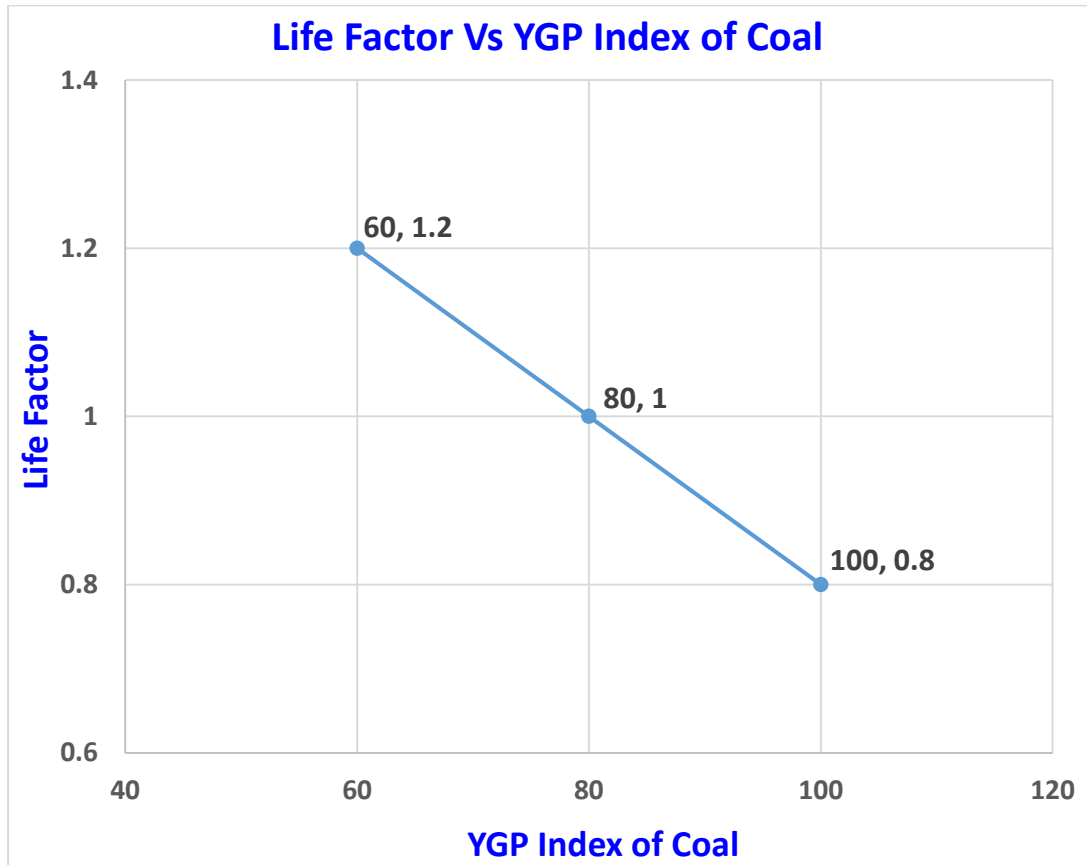
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**CORRECTION CURVE\* FOR WEAR LIFE**  
**Vs**  
**YGP INDEX OF COAL**



**FIGURE 1**

\*This is a typical curve for reference purpose only and indicates the variation of the life factor of the Grinding Elements with the variation of the YGP Index of the coal being pulverised in the Coal Mills.

The wear life of the grinding elements depends on many factors like, YGP Index, Ash and the amount of Silica in the ash, mineral matter (quartz & pyrites), bulk density, HGI & Moisture of coal, PF Fineness and usual O&M practices.

In cases where BHEL's Customer does not specify coal quality for a particular tender, a written confirmation shall be warranted from supplier as required by customer for the guaranteed wear life (GWL). However, the past experience of Supplier/BHEL shall be taken as reference for coal quality for firming up the GWL.

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