



BHARAT HEAVY ELECTRICALS LIMITED

**Heavy Power Equipment Plant
Ramachandrapuram, Hyderabad – 502 032,**

ANNEXURE-A (to BHEL Specification BA35038)

Doc No.: PBTP-RHTPP-GR-35038

1.0.0. Intent of The Specification

The intent of the specification is to procure “Wear parts” (Grinding Rolls and Bull ring segments) for XRP-1003 type coal pulverisers of BHEL make operating at **NTPC-RIHAND**.

It is not the intent to specify completely herein, all aspects of material selection and manufacturing process, nevertheless, the wear parts shall conform in all aspects to high standards of material quality, manufacturing process and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to the owner, who will interpret the meaning of specification, drawings and shall have right to reject or accept any work or material which in his assessment is not complete to meet the requirement of this specification.

Bidder is request to carefully examine and understand the specification and seek clarifications, if required, to ensure that they have understood the specification. The Bidder's offer should not carry any section like clarifications, Interpretations and /or assumptions. Also, the offer should not be conditional with respect to the Operation and Maintenance practices at the station.

2.0.0 Not Applicable

3.0.0. Applicable Drawings

The drawing listed below and forming part of the specification is for Bidder's information. All these drawings and indicative of Owner's requirement to enable the Bidder to make a suitable offer. It shall however, be responsibility of the Contractor to ensure fitment of the supplied material.

i.	Drawing No. SPD-BMD-A-32648	Grinding Rolls
ii.	Drawing No. SPD-BMD-A-42646	Bull Ring Segments

Any variation/alteration from the listed drawings shall be clearly brought out in the technical deviation schedule with implications if any, such variations may be acceptable, after assessment of its implication and shall be subject to Owner's approval.

4.0.0 Scope of the Proposal

The scope of the proposal shall include manufacturing, testing, packaging, transportation, delivery on F.O.R (BHEL-Hyderabad) basis of wear parts of XRP-1003 type coal Pulverisers comprising of the following:

- i. Grinding Rolls

- ii. **Bull Ring Segment**
- iii. **Additional Pulveriser components (refer Note 1)**

The scope of proposal shall also include supervision of installation (supervision of installation of 1st of wear parts in each mill) of above wear parts.

Note 1: In case the installation and fitment, commissioning, operation, grinding process optimization and/or achievement of guaranteed wear life of wear parts require some additional components (other than grinding roll and bull ring segment) with new design/material of components, same shall also be included in the scope of supply of the Contractor in such quantities that they last the complete period of wear life guarantee of 10000 Hrs. of pulverisation operation for each pulveriser. It is responsibility of the Bidder to familiarize himself with the design of specified pulveriser model, its grinding roll and bull ring segment and requirement of additional components for the same. In case Bidder's proposal does not include the additional components mentioned above and/or their adequate quantities and if same become necessary for installation and/or satisfactory operation of the pulveriser and/or to achieve the guaranteed wear life of the grinding rolls and bull ring segment over stipulated period of pulveriser operation i.e.10000 hrs., the Contractor will be required to supply the same without any cost implication to the Owner. Pulveriser components which are not required to undergo design/material change for installation and fitment, commissioning, operation, grinding process optimization and/or achievement of guaranteed wear life of part offered by the Bidder during stipulated period of 10000 hrs. Shall, however, be replaced by the Owner as per past established maintenance practice. The delivery schedule of wear parts shall be considered to be completed by the Contractor only on such date when all the wear parts (all sets of grinding rolls and bull ring segments) are supplied with adequate quantity of above mentioned additional mill components so as to last for 10000 hrs. of pulveriser operation of each pulveriser.

4.1.0 The scope of supply of Contractor shall include supply of mill wear parts, that is grinding rolls, set of bull ring segments and additional mill components (refer Note 1 and Note 2) for **43 no. of coal pulverisers** such that these wear parts are compatible with each other.

Note 2: Together three nos. grinding rolls required for one pulveriser shall form "One set of Grinding rolls" and bull ring segment required for each pulveriser shall form "One set of Bull Ring Segments". The required quantity of additional pulveriser components (as per Note 1) for entire period of guaranteed wear life of each set of grinding rolls and bull ring segments shall deemed to be included in scope of each set of grinding roll/each set of bull ring segments and the price of these additional mill components shall deemed to be included in the price of respective sets of grinding rolls and / or bull ring segments.

4.2.0 The quantity of wear parts shall be such that 10000 hrs. of operation of pulveriser can be achieved with pulveriser capable of delivering rated output at rated fineness (refer note-3) for specified range of coals. The Bidder shall guarantee the life for each type of wear part (i.e. grinding roll, bull ring segments and additional component if any) and this guaranteed life shall be the basis of calculating the quantity of wear parts. The guarantee for wear parts life shall be in line with the guarantee requirement specified in subsequent sections.

Note 3: The rated fineness not less than 70% through 200 mesh and 99.5% through 50 mesh

4.3.0 In the bid proposal the Bidder is required to offer the wear parts such quantities that the cumulative wear life for each type of wear part (i.e. grinding rolls, bull ring segments and additional components if any) is not less than the number of hours resulting from multiplying number of coal pulverisers for which wear part are being procured X 10000 operating Hrs. The required Quantity/sets of wear parts shall be arrived at by rounding off the fractional part of the set to next higher whole number.

4.4.0 The wear life guarantee for each type of wear parts shall be from within the range of 5000 Hrs. – 10000 Hrs. and quantity of wear parts shall be calculated based on guaranteed wear life from within the above range only. An example of arriving at number of sets of wear parts for the purpose of Bidder's quotation is given below at table-1:

Example:
Table – 1

S. No.	Description	Bidder A	Bidder B
1.	Number of coal pulveriser as per specification	8	8
2.	Guarantee wear life of each set of grinding roll	5000	7000
3.	Guarantee wear life of each set of bull ring segments	5000	7000
4	Number of grinding rolls required to be quoted per mill	$10000 \times 8 / 5000 = 16$ sets	$10000 \times 8 / 7000 = 11.42$ i.e. 12 sets
5	Total number of sets of bull ring segments required to be quoted.	$10000 \times 8 / 5000 = 16$ sets	$10000 \times 8 / 7000 = 11.42$ i.e. 12 sets

5.0.0 Evaluation Criteria

The bids guaranteeing wear life less than 5000 Hrs. will not be considered for evaluation and shall be rejected. Further, no evaluation credit will be given for guaranteed wear life in excess of 10000 Hrs.

The evaluation of the bids shall be based on the total price of (a) sets of bull ring segments and (b) sets of grinding rolls and quoted by the Bidder in accordance with the clause 4.0.0 "Scope of the Proposal". Any additional component required as per Note 1 will be deemed to be included in the total quoted price of wear parts. (i.e. grinding rolls and bull ring segments)

6.0.0 Material of Construction

The material of construction of wear parts shall be selected taking into account highly abrasive nature of coal resulting from coal contamination with silica sand and Alpha-quartz. The coal and ash data is specified elsewhere in the specification and same shall be considered for selection of wear part material and offering guarantee for wear life.

S. No.	Name of Wear Part	Material
1.	Bull Ring Segments	Ni Hard, High Chrome, Hi-Cr with ceramic inserts, Sinter Cast etc.
2.	Grinding Rolls	Ni Hard, High Chrome Carbide Insert, Sinter Cast etc.

Note: - The Ni-hard Rolls shall be manufactured using centrifugal casting method.

The materials selected by the contractor for the mill wear parts and additional mill components (if required) must have been used satisfactorily in at least six(6) numbers of coal pulverisers having similar or higher rated capacity.

7.0.0 Coal Characteristics

The range of coal and ash characteristics, which is likely to be supplied to the mills, is enclosed at Annexure - 1. Bidder is requested to familiarize themselves with the detailed coal and ash characteristics, if required. No allowance will be given on wear part life on account of change in coal and ash characteristics except for YGP index. (see clause 8.1.2 & 8.3.4)

The material of construction of wear parts shall be selected taking into account highly abrasive nature of coal resulting from coal contamination with silica sand and Alpha-quartz. Bidders shall consider the effect of these shale, sand stone and alpha quartz content for offering guaranteed wear life of Mill wear parts.

8.0.0 Guarantees

The quantity of wear parts shall be such that 10000 hrs of operation of each mill can be achieved.

The Bidder shall guarantee the wear parts for wear life and fitment of wear parts in the existing mills and furnish these guarantees in Schedule - I.

8.1.0 Guaranteed Wear Life

The "each set of wear parts", i.e. each set of 3 grinding rolls, each set of bull ring segments and additional components (if any) shall be guaranteed for wear life in number of hours of mill operation with mill capacity not less than 90% of its maximum capacity at rated fineness for the specified range of coals during this period.

8.1.1 The guarantee on wear life shall be provided for each type of wear part separately (i.e. Grinding Rolls, Bull Ring Segments and additional component if any). The guaranteed wear life for each set of grinding rolls and each set of bull ring segments and additional component (if any) shall be from within the range of 5000 - 10000 "Operating Hours of mill" (With mill capacity not less than 90% of its maximum capacity at rated fineness for the specified range of coals). Bidders offering wear life guarantee less than 5000 Operating Hours shall not be considered for evaluation. Further, Bidder's offering wear life guarantee higher than 10000 Operating Hours shall not be given any evaluation credit beyond 10000 Hrs. The guaranteed wear life of set of bull ring segments shall be 'in multiples of wear life guaranteed for set of grinding rolls (i.e. if life of grinding rolls is guaranteed as 2500 Hrs, the life of set

of bull ring segments shall be either 2500 Hrs or 5000 Hrs). The material and design of additional mill components shall be so selected by the Contractor that their replacement coincides with the replacement of set of grinding rolls and /or set of bull ring segments.

8.1.2 The mill wear part guarantee shall be valid for complete range of coal and ash characteristics specified in this specification. No correction in guaranteed wear life shall be allowed within the above range of coal and ash characteristics except for YGP index. For variation in YGP Index of coal beyond the specified range the Bidder may submit the correction curve, indicating change in wear life w.r.t. YGP Index, along with Bid. The correction curve shall be subject to Owner's approval.

8.1.3 The guarantee for Rolls and Bull ring segments shall be specified against the wear depth.

8.2.0 Wear Part Warrantee: - The Bidder shall guarantee the wear life of wear parts in number of mill operating hours (Refer note 4). The guarantee/warrantee on wear life shall be demonstrated on all the pulverisers.

Note - 4: Operating Hours of mill for the purpose of wear part guarantee are defined as hours of mill operation at or near to its maximum capacity but not less than 90% of maximum mill output at mill fineness not less than 70% thru 200 mesh and 99.5% through 50 mesh.

8.3.0 Demonstration of Pulverisers Wear Part Guarantee:-

8.3.1 The Guarantee/warrantee for the life of mill wear parts shall be demonstrated by the Contractor during the Guarantee Trial Period (GTP). The GTP shall commence after successful operation of the Pulverisers established continuously for a period of not less than 12 hrs at or near to its maximum capacity and fineness not less than 70% thru 200 mesh and 99.5% through 50 mesh with the newly installed wear parts. The GTP shall end as soon as first set of grinding rolls and first set of bull ring segments have completed their actual wear life or the guaranteed wear life (whichever is earlier) in first four Pulverisers. However, in case the wear parts are supplied in more than one lot, the Pulverisers Wear Part Guarantee demonstration as per the above shall be repeated for each lot of wear parts.

8.3.2 Each type of wear part (set of grinding rolls, set of bull ring segments) shall be considered to have passed their guaranteed/warranted wear life when during GTP the first set of these parts have successfully demonstrated their capability to achieve at least 90% of the maximum mill grinding capacity (at pulverised coal fineness not less than 70% thru 200 mesh and 99.5% through 50 mesh) during the guaranteed wear life of wear parts. In case the capacity of pulveriser falls by more than 10% and /or pulverised coal fineness falls below 70% thru 200 mesh and 99.5% through 50 mesh necessitating replacement of particular type of wear part (i.e. set of grinding rolls, set of bull ring segments) to restore the capacity and /or fineness, the wear part shall be deemed to have outlived its wear life. The capacity of mill shall be tested on all mills during the GTP at following intervals, viz.(i) at commencement of GTP (ii) at completion of 25% of guaranteed wear life of grinding rolls, (iii) at completion of 75% guaranteed wear life of grinding rolls and (iv) at the end of guaranteed life of grinding rolls the capacity tested on mill shall continue for second set of grinding rolls as per ii), iii), and iv) above until the wear life of bull ring segment is achieved.

8.3.3 Further, in case any of the wear parts has worn out to such an extent that either the normal or safe operation of the Pulverisers is jeopardized if this part is not replaced/ repaired or continuous use with this part may lead to exposure or wear of other parts which are not meant for the purpose of checking the shortfall in wear life, even if there is no reduction in

Pulveriser rated capacity or fineness, then the part shall be deemed to have outlived its wear life.

8.3.4 Average Wear life during GTP considered for pulveriser wear part warrantee shall be arrived at from the station record for each pulveriser and as corrected for variation in YGP index of coal being fired during GTP (The correction for variation in YGP index is applicable only when the average YGP index falls beyond the range as indicated in Annexure-1 for Coal Characteristics). For this purpose, the coal YGP shall be the average tested value during GTP. The coal samples shall be collected periodically (the frequency of sampling shall be mutually agreed between owner and contractor). The YGP index testing shall be done as per BS standard. A jointly signed record shall be maintained during GTP.

8.4.0 Liquidated Damage for Shortfall in Guaranteed/Warranted Wear Life:

8.4.1 Liquidated damages shall be levied for shortfall in wear life of wear parts for each type of wear part separately. For the purpose of ascertaining the wear life achieved following method shall be adopted:

8.4.2 The wear life of set of wear parts (grinding roll and bull ring segments) shall be recorded for all pulverisers. The average wear life of first sets of wear parts in four pulverisers in which the wear parts have completed their wear life earlier than other pulverisers shall be considered as wear life achieved by that type of wear part. Table-II below explains how the wear life is to be calculated for the purpose of establishing compliance to guaranteed wear life and levying liquidated damages in case of shortfall.

Following method is an example where wear parts required for 6 No.s of pulverisers as per clause 4.1.0 were procured, first sets of wear parts of the supply lot were installed and all the first sets have completed their life. Table – II below explains how the average wear life is to be calculated for the purpose of establishing compliance to guaranteed wear life and levying liquidated damages in case of shortfall.

Table - II

S. No	Description	Min. Guaranteed Wear life	life achieved for first set of wear parts					
			Mill 1	Mill 2	Mill 3	Mill 4	Mill 5	Mill 6
1.	1 st Set of grinding rolls, Hrs	5000	3500	2600	2550	2550	2625	2450
2	Set of bull ring segments	5000	3500*	2600*	2550*	2550*	2625*	2450*

Note: (*) As set of bull ring segments are required to be guaranteed for wear life in multiples of hours guaranteed for set of grinding rolls the replacement of bull ring segments at the time of replacement of one sets of grinding rolls.

From Table – II it can be seen that Mill Nos. 6, 4, 2 and 5 the first set of grinding rolls have completed their wear life earlier than others (in terms of time from installation of wear parts). Therefore for the purpose of establishing the wear life achieved by the set of grinding rolls, average of life achieved in mills # 6, 4, 5 and 2 shall be considered i.e. $(2450 + 2550 + 2625 + 2600)/4 = 2556$ Hrs).

8.4.3 In case the wear parts do not fulfill the guaranteed wear life the credit shall be provided after the end of GTP to the Employer at the rate of one and a half times the shortfall worked out for each set of grinding roll, each set of bull ring segments. For example should a wear part set has a price of Rs 10000 (Rupees Ten Thousand) and the wear life guaranteed for the wear

part is 5000 Hrs. When the set of wear parts which fail to meet the warranty test lasts only 4000 Hrs. out of guaranteed 5000 Hrs. a credit of Rs. $(10,000 \times 1.5 \times 2000) / 4000 = \text{Rs. } 7500$ would apply towards the Employer for each set of wear parts. This credit shall apply to all wear parts by multiplying the credit per set of wear part with total number of wear part sets in that lot and shall be considered as Liquidated Damages for shortfall in wear life. The wear part credit shall be worked out separately for grinding rolls and separately for bull ring segments.

8.4.4 At the end of GTP if it is found that any of the wear part set viz. Grinding rolls and /or bull ring segments have achieved life 50% or less than the guaranteed wear life the Contractor shall replace the wear parts set free of cost and commence the GTP again till such time the wear parts are able to achieve wear parts life higher than 50% of wear life. For wear life between 50 % and 100% the liquidated damages as described above shall apply.

If any wear part fails to achieve 50 % of guaranteed life even after GTP, the Contractor shall replace the wear part set free of cost as per clause 4.4.0.

8.4.5 The bidder shall supply the material in lot size which will be decided while placing the Purchase Order. In case the wear parts are supplied in more than one lot the liquidated damages as per the above shall be levied for each lot of wear parts.

8.5.0 Fitment Guarantee

8.5.1 Fitment of the supplied material in the identified Pulverisers is the responsibility of contractor and same shall be guaranteed by the Bidder. In case it is found that the supplied material (wear parts) do not fit into the pulveriser and/or the normal and safe operation of the pulveriser cannot be sustained with the supplied wear parts during GTP, the Contractor shall within one month supply fresh lot of modified wear parts (not less than 25% of the quantity) to replace the wear parts which have failed in fitment and/or have restricted normal/ safe operation of pulverisers. In case the normal/safe operation is jeopardized due to wear of grinding rolls and bull ring segment the same shall be considered under the guarantee for wear life and not under fitment guarantee.

9.0.0 Quality Assurance & Inspection

9.1.0 Bidder shall provide the necessary information on Quality Assurance Program containing the overall Quality management and Procedures, which the Bidder proposes to follow during various stages of manufacturing of the specified wear parts. The contractor shall also submit a detailed manufacturing quality plan in the formats **(to be informed separately)** detailing out the tests/checks carried out by the manufacturer, during various stages of manufacturing, for BHEL's customer approval. The quality Plan shall be accompanied with all the entire plan standards, reference documents, acceptance norms, procedures and specifications. The indicative tests/checks, which shall necessarily form part of the Quality plan, are as follow:

- I. Chemical Composition and heat treatment.
- II. Mechanical properties and measurement of hardness.
- III. Wear – resistant parts shall be UT/RT tested to check soundness after suitable heat treatment. In case of bi-metallic castings, UT shall be carried out for ensuring the proper bonding.
- IV. Metallurgical test: Micro-structure examination will be carried out on samples selected at random.
- V. Surface defects of the wear resistant parts shall be examined by DPT.
- VI. To ensure proper fitment at site each grinding roll shall be subjected to blue-matching check for proper bore surface contact. In case of bull ring segment trial assembly shall be carried out for each set on the test bowl.
- VII. Weldments on any other mill component shall be checked with suitable NDT.

9.2.0 The approved Quality Plan shall indicate BHEL's customer witness points (customer hold points) for which the contractor shall give 15 days' inspection advance notice for undertaking inspection.

10.0.0 Any requirement, as specified by BHEL's customer shall be confirmed by the bidder.

Note: The technical specification includes following forms which need to be duly filled by the Bidder and submitted along with the bid:

Schedule – I: Guarantee Declaration, Schedule – II: Technical Data Sheets, Schedule – III: Information Regarding Quality Assurance Plan, Schedule – V: Delivery Schedule.

COAL & ASH CHARACTERISTICS

PROXIMATE ANALYSIS OF COAL	UNIT OF MEASUREMENT	RANGE	
		FROM	TO
MOISTURE	%	5	10
ASH	%	30	45
HGI	Index	50	65
qYGP INDEX	mg/Kg of Coal	40	75
ASH ANALYSIS			
SILICA	%	60	70
ALUMINA	%	25	30

Schedule- I

TECHNICAL SPECIFICATION FOR PROCUREMENT OF WEAR
PARTS FOR XRP 1003 COAL PULVERISERS

Tender Document No.:

(GUARANTEE DECLARATION)

Bidder's Name & Address

BHEL-HYDERABAD

Dear Sir,

We declare that the wear life of wear parts, their fitment and material specification for wear parts offered in this bid are guaranteed by us. We further declare that in the event of any deficiencies in meeting the guarantees indicated below as established in accordance the bidding documents, you may at your discretion accept the wear parts after assessing the liquidated damages as specified in clause 8.4.0 of bidding documents or reject the wear parts and recover the payment already made.

S. No.	Guaranteed Parameter	Guaranteed Figures
1.0	Wear Life of Wear parts	
1.1	Wear life of each set of grinding Rolls in Operating Hours at -----mm wear depth as per Clause 8.0.0	
1.2	Wear life of each set of bull ring Segments in Operating Hours at ---- mm wear depth as Per clause 8.0.0	
1.3	Wear life of Additional component(if any) in Operating Hours	
2.0	Guarantee for fitment	as per bidding document clause 8.5.0
Date:	(Signature)	
Place:	(Printed Name)	
	(Designation)	
	(Common Seal)	

Note : A) Wear life guarantee for Set of Grinding roll, set of bull ring segments and Additional component(if any) shall be same.
B) Any Variation to the stipulated conditions under which Guarantees are to be met will not be permitted and Bids with such variation are liable to be rejected.

**TECHNICAL SPECIFICATION FOR PROCUREMENT OF WEAR
PARTS FOR XRP 1003 COAL PULVERISERS**

Tender Document No.

(Technical Data Sheets)

S. No.	Description	Grinding Rolls	Bull Ring Segments
1	Name of manufacturer		
2	Location of Manufacturing Unit		
3	Model of Coal Pulveriser		
4	Number of Pulverisers		
5	Number of sets		
6	Number of items in each set (Bidder to list all the additional mill components as per Note 1.		
7	Wear life of each set		
8	Weight of each item (Bidder to Provide item wise		
9	Weight of each set		
10	Compliance to specified dimensions	Yes	Yes
11	Name of material		
12	Surface hardness		
13	Physical properties of material		
14	Chemical composition of material		

Date:

Place:

(Signature)

(Printed Name)

(Designation)

(Common Seal)

Schedule- III

TECHNICAL SPECIFICATION FOR PROCUREMENT OF WEAR
PARTS FOR XRP 1003 COAL PULVERISERS

Tender Document No.

(Information regarding Quality Assurance program)

Bidder's Name & Address
Dear Sirs,

BHEL-HYDERABAD

We hereby provide the necessary information on Quality Assurance program containing the overall Quality management and Procedures, which we propose to follow during various stages of manufacturing the specified wear parts.

Date:
Place:

(Signature)
(Printed Name)
(Designation)
(Common Seal)

Note : Continuation sheets of like size and format may be used as per Bidder's requirement and shall be annexed to this Attachment.

TECHNICAL SPECIFICATION FOR PROCUREMENT OF WEAR
PARTS FOR XRP 1003COAL PULVERISERS

Tender Document No.

(Delivery Schedule)

Bidder's Name & Address

BHEL-HYDERABAD

-
- 1 Grinding Rolls
 2. Bull Ring Segments
 3. Additional Mill Components as per Note 1

Note: Bidder to provide list of additional pulverizer components.

Date:
Place:

(Signature)
(Printed Name)
(Designation)
(Common Seal)