



ISG, BANGALORE

ENQUIRY SPECIFICATION FOR
ASH HANDLING PLANT (AHP)
PATRATU SUPER THERMAL POWER STATION
EXPANSION PHASE-I (3x800MW)

Specification No.
IS-1-17-2005/001/TS

ENQUIRY SPECIFICATION

FOR

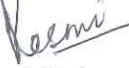
ASH HANDLING PLANT (AHP)

FOR

PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3x800MW)



BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP
BANGALORE

Section	Prepared by	Checked by	Approved by
Mechanical	 Nitin Vikash	 Amit Gupta	 R Tirupati Rao
Electrical	 Rakesh Sonwani	 Sashikumar G	 Resmi Nair
Civil	 Prashanth Kumar Rai	 Penchal Reddy M	 Sanjay C Chinivar



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A. LIST OF ANNEXURES ENCLOSED (Bidder has to refer all annexures attached)

Annexure No	Description
Annexure-1:	Plot Plan- PDF Copy- (1 sheet)
Annexure-2:	Project Information
Annexure-3:	NIT Ash Flow diagrams Rev-D – (2 sheets)
Annexure-4:	HSE Manual
Annexure-5:	List of Drawings, Documents and QAPs
Annexure-6:	Complete NTPC NIT Specifications (Section I to VII)
Annexure-7:	Complete Clarifications & Amendments issued by NTPC (All sheets)
Annexure-8:	BHEL Ash collection data
Annexure-9:	Scope matrix Mechanical with Civil & Structural
Annexure-10:	Scope matrix Mechanical with Electrical and C&I
Annexure-11	Vendor list for AHP Package
Annexure-12A	Mandatory Spares for Mechanical, Electrical and C&I
Annexure-12B	List of Commissioning Spares
Annexure-13:	Provenness criteria (Sub-QR for AHP)
Annexure-14:	Packing instructions
Annexure-15:	Guaranteed Power Consumption
Annexure-16:	Title block and other formats (BBU, QAP)
Annexure-17:	Technical Datasheet



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NOTE: BHEL specification are to be read in conjunction with the NTPC NIT specification and clarifications & Amendments (As per Annexure-6&7) along with all other annexures listed above.



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SECTION – 1.0

1.0 PROJECT INFORMATION

Patratu Super Thermal Power Project (PSTPP) in District Ramgarh of Jharkhand conceived as a coal based super thermal power plant for implementation by Patratu Vidyut Utpadan Nigam Limited (PVUNL). The configuration of expansion of 4000 MW shall consist of 5 units of 800 MW to be implemented in two phases; Phase-I: 3x800 MW and Phase-II: 2x800 MW. The present proposal is for **“Patratu STPS Phase-I (3x800 MW) ”**.

SYNOPSIS

<u>SYNOPSIS</u>	
Location	Patratu Thermal Power station (PTPS) is located just outside the coal belt of South Karanpura in Ramgarh District of Jharkhand State.
Nearest Railway station	The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line.
Nearest commercial Airport	The nearest commercial airport is Ranchi at about 45 km by road.
Available land	About 1234 acres
Water	The make-up water for PSTPS is to be met from Patratu Dam on Nalkari River.
Capacity	3x800 MW

NOTE:

- Bidder should refer Annexure-2 for complete project information including Coal characteristics, raw water, climate conditions etc.

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SECTION – 2.0

2.0 STANDARDS AND CODES

2.1 In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India, NTPC Rules & Codes of Practices as well as of the locality where they will be installed, including the following:

- a) Indian Electricity Act
- b) Indian Electricity Rules
- c) Indian Explosives Act
- d) Indian Factories Act and State Factories Act
- e) Indian Boiler Regulations (IBR)
- f) Regulations of the Central Pollution Control Board, India
- g) Regulations of the Ministry of Environment & Forest (MoEF), Government of India
- h) Pollution Control Regulations of Department of Environment, Government of India
- i) State Pollution Control Board
- j) Rules for Electrical installation by Tariff Advisory Committee (TAC)
- k) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996
- l) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998
- m) Explosive Rules, 1983
- n) Petroleum Act, 1984
- o) Petroleum Rules, 1976
- p) Gas Cylinder Rules, 1981
- q) Static and Mobile Pressure Vessels (Unified) Rules, 1981
- r) Workmen's Compensation Act, 1923
- s) Workmen's Compensation Rules, 1924
- t) NTPC Safety Rules for Construction and Erection
- u) NTPC Safety Policy
- v) Any other statutory codes / standards / regulations, as may be applicable

2.2 Unless covered otherwise in the specifications, the latest editions, of the codes and standards given below shall also apply:

- a) Bureau of Indian standards (BIS)
- b) Japanese Industrial Standards (JIS)
- c) American National Standards Institute (ANSI)
- d) American Society of Testing and Materials (ASTM)
- e) American Society of Mechanical Engineers (ASME)
- f) American Petroleum Institute (API)
- g) Standards of the Hydraulic Institute, U.S.A.



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- h) International Organization for Standardization (ISO)
- i) Tubular Exchanger Manufacturer's Association (TEMA)
- j) American Welding Society (AWS)
- k) National Electrical Manufacturers Association (NEMA)
- l) National Fire Protection Association (NFPA)
- m) International Electro-Technical Commission (IEC)/ European Norms (EN)
- n) Expansion Joint Manufacturers Association (EJMA)
- o) Heat Exchange Institute (HEI)
- p) IEEE standard
- q) JEC standard

- 2.3** Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned elsewhere in the specification together with the complete word to word translation of the standard that is normally not published in English.
- 2.4** National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW,VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment under this package. However, for those of the equipment not covered by these National / International standards, established and proven standards of manufacturers shall be considered.
- 2.5** In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, most stringent shall govern.
- 2.6** Two (2) English language copies of all national and international codes and/or standards used in the design of the plant and equipment shall be provided by the Contractor to the Employer within two calendar months from the date of the Notification of Award.
- 2.7** In case of any change in codes, standards & regulations between the date of bid opening and the date when Bidders proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.
- 2.8** A detailed list of standards apart from those mentioned in the respective detailed specifications in other parts of Section-VI of NTPC's Specification to which all equipment/systems/civil works should conform as indicated in Section-VI- Part C and elsewhere in the specification.

SECTION – 3.0

3.0 INTENT OF SPECIFICATION

The package shall be on the basis of single point responsibility, completely covering the following activities and services in respect of all the equipment & works specified and covered under the specifications:

- a. Basic Engineering of the Ash Handling Plant including plant definition manual as per NTPC/ BHEL requirement (flow diagrams, layout drawings etc.).
- b. Detailed design of all the equipment and equipment system(s) included in bidder's scope (All general arrangement drawings and equipment/ system drawings along with load data, various schedules/power calculations etc. as per NTPC/BHEL requirement).
- c. Providing engineering drawings, equipment selection and sizing calculations, technical datasheet, performance data, instruction manuals, as built drawings and other information.
- d. Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required for all the equipment and systems covered under the scope.
- e. Complete manufacturing including shop testing/type testing with shop/job motors as required. Bidder to offer all the items/ materials for inspection, by BHEL/ NTPC/third party as the case may be, prior to dispatch from shop. Necessary approval for drawing/ documents for all item/ equipment from NTPC/ BHEL shall be obtained by the bidder prior to procurement/ manufacturing. Make approval shall be taken by the bidder from NTPC/BHEL for all the items prior to procurement/ manufacturing.
- f. Construction Power at 415 V (3 phase) level shall be provided at one point of the project "Site" on chargeable basis. Further distribution of construction power from the supply point of BHEL/ NTPC by installing Electric Meter and Electricity charges will be deducted from their bill at per rates prevailing to Site. Further distribution including tariff/energy meter, Power Cabling and other equipment required installation, shall be carried out by the bidder as per his requirement. (Refer Scope).
- g. Construction water shall be provided free of cost at one point. Further distribution of construction water from the supply point of BHEL/ NTPC is in Bidder's scope (Refer Scope).
- h. Packing and transportation from the manufacturer's works to the site including logistic studies, customs clearance & port clearance, port charges, if any.
- i. Receipt, unloading, storage (open & closed), preservation, handling and conservation of equipment at site.
- j. Fabrication, pre-assembly, if any, transportation within the site, erection, testing, commissioning and completion of facilities including putting into satisfactory operation of all the equipment include successful completion of initial operation.
- k. Performance and guarantee tests after successful completion of initial operation.



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- l. Supply of spares on FOR site basis.
- m. Reconciliation with customs authorities, as required.
- n. Conclusion of the contract.

The Bidder shall be responsible for providing all material, equipment and service, which are required to fulfill the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under scope of work in this specification, irrespective of whether it has been specifically listed herein or not. It is not the intent to specify herein all aspects of design and construction; nevertheless, the equipment's shall conform in all aspects to high standard of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to PVUNL/NTPC/BHEL, who will interpret the meaning of the specification and drawings and shall have a right to reject or accept any work or material which in his assessment is not complete to meet the requirements of this specification and/or applicable to Indian/ International standards mentioned elsewhere in this specification.

Bidders shall submit the offer strictly in line with the technical specifications and instructions provided in this document. In case the requirements mentioned in these documents are not complied with, the offers may be considered as incomplete and would become liable for rejection.

In the event of any conflict/ambiguity between the specifications for any particular equipment/ system, in the standard &/or specification, &/or interpretation of clauses in this enquiry specification and its enclosures, the more significant/ stringent of the two specifications shall prevail. The decision of BHEL shall be final and bidder shall adhere to the same without any additional cost implication to BHEL.

3.1 Additional Requirements

- a. Before submitting the bid, the **Bidder should inspect and examine the site and its surroundings** and should satisfy himself as to the nature of the ground and subsoil, the quantities and nature of work, materials necessary for completion of the work and their availability, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No consequent extra claims on any misunderstanding or otherwise shall be allowed by BHEL after award of the contract under any circumstances.
- b. Bidder shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to the activities of the Bidder on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately rectified by the Bidder at his own cost to the satisfaction of PVUNL/NTPC/BHEL. The Bidder shall also take all necessary

safety measures during erection/ commissioning activities, at his own cost, to avoid any harm or injury to his workers and staff from the equipment and facilities of the power plant.

- c. For his site office and covered store buildings, the Bidder shall adopt pre-engineered/ pre-fabricated constructions made of steel with single/ double skin, insulated or un-insulated roof and wall coverings (fabricated out of permanently color coated metal sheets). Alternatively, Bidder can adopt readymade 'Portacabin' or similar construction. Bidder shall ensure that all such constructions are well engineered, neatly constructed and overall present a pleasing look.
- d. In line with Gazette Notification on Ash Utilization issued by MOEF and its amendment thereafter, Bidder shall use ash and ash based products in works as specified in these specifications, drawings and as per instructions of the Engineer. He shall also use ash and ash based products in construction of his offices, stores, staff quarters/ labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products periodically.
- e. Bidder shall establish/set up at site suitable repair facilities for construction plant, equipment and machinery (like cranes, pumps, material handling machineries etc.) In case of cranes, material handling machineries etc. he will also make arrangements/ tie up with equipment manufacturers/ suppliers for periodic overhaul/maintenance and for major breakdown, if any. He shall also keep adequate stock of spares at site for various plant, equipment and machinery to meet day to day requirements as recommended by the equipment manufacturer/suppliers or as instructed by the Engineer. Bidder shall deploy dedicated qualified, full time mechanical/electrical foreman/supervisors for manning the repair facilities as specified above.

3.2 OTHER GENERAL REQUIREMENTS

Items though not specifically mentioned in the specification but needed to complete the equipment/systems to meet the intent of specification, shall also be deemed to be included unless otherwise specifically mentioned in exclusions. So, the Bidder should carefully study all the NIT documents and understand the complete scope of work as per NIT documents while submitting the offer.

3.3 Paints

The Bidder's scope of work includes supply of paints and painting of all equipment and structures as per stipulated requirements and NTPC's standard color coding scheme.

3.4 Pre-commissioning and commissioning activities

The Bidder's scope shall include all pre-commissioning and commissioning activities, materials and services as detailed in other portion of NIT specifications including supply

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of all consumables, temporary equipment (if any), instruments as per scope, labor/skilled manpower's etc.

3.5 Consumables, First Fill of Oils & Lubricants

All the first fill of consumables and one Year's topping requirements or 10 % of first fill quantity, whichever is more, of consumable such as greases, oil, lubricants, servo fluids/control fluids, gases and essential chemicals etc. which will be required to put the equipment covered under the scope of work, into successful commissioning/initial operation and to establish completion of facilities shall be furnished by the Bidder. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum. This additional quantity shall be supplied in separate Containers.

Guarantee Tests

The guarantee tests for various equipment and systems shall be carried out as specified under chapter of Functional Guarantees. All special equipment, tools and tackles, instruments, measuring devices required for the successful conductance of Guarantee Tests shall be provided by the Bidder, free of cost. All costs associated with the tests shall be included in bid price.

All statutory clearances necessary for guarantee tests shall be obtained by the bidder from respective authorities without any additional cost to BHEL.

Auxiliary Power Consumption:

The station auxiliary power consumption for the entire Ash Handling Plant shall not exceed 11600 kW (Refer Annexure-15). Same shall be submitted as separate sealed envelope along with price bid. Also the Bidder shall furnish equipment wise power consumption for major equipment. Liquidity damages shall be applied as per SCC on account of shortfall in auxiliary power consumption during PG test.

Cooling air requirement for dry bottom ash system:

The maximum cooling air quantity for dry bottom ash handling system shall not exceed 47 t/h at 100% BMCR DC load.

3.6 Spares

The scope of supply of Bidder includes supply of mandatory spares, start-up and commissioning spares, recommended spares, consumable spares and other spares as required for Ash Handling Plant erection, testing, commissioning, PG test, startup, initial operation etc.

3.7 Special Tools & Tackles and Test/Measuring Equipment

One set of all special tools and tackles including testing, calibrating and measuring instruments required for erection, assembly, disassembly and maintenance & testing of all equipment/systems covered under the scope of the Bidder shall be supplied by the Bidder. The Bidder shall not use these special tools, tackles and testing/measuring



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equipment for erection/commissioning purposes and shall be in an unused and new condition, when they are handed over to the Employer. A list of all such special tools and tackles shall be submitted along with the offer.

3.8 GENERAL ENVIRONMENTAL REQUIREMENTS

The Bidder shall execute all work at site as per the general environmental requirement and following the applicable codal provisions and local regulations in this respect. The Bidder shall provide and install suitable safeguards and facilities as approved by the Engineer for meeting general environment requirements given herein under. Detailed guideline to be referred in NTPC specification.

SECTION – 4.0

4.0 SCOPE OF SUPPLY AND SERVICES

The Scope of supply & services includes System Design, Engineering, sizing and selection of equipment, Manufacturing, Procurement, supply of equipment including spares[Commissioning, Mandatory(as per list) and startup], Electrical and Control & Instrumentation, technological structures/ other structures if any, Inspection & Testing, shop floor testing, shop floor painting, packing & transportation to site including customs clearance/ port clearance, Construction of storage, Receipt and Unloading at site, Storage and Security, Intra site handling, Erection & Commissioning, Final Painting at site, System integration, Trial run, Performance Guarantee Testing and handing over of complete Ash Handling Plant package as EPC Turnkey package for 3x800 MW Patratu STPS Phase-1 to PVUNL.

Bidder shall include the responsibility of technical coordination (including participation in technical co-ordination meetings with BHEL/NTPC/PVUNL), finalization of drawings/ documents, submission of engineering & civil assignment drawings/ documents and processing of their approvals by NTPC/PVUNL/ BHEL. Bidder shall be solely responsible for submission & approval of drawings/ composite layouts/ flow diagrams/ data sheets/ QAP/ Field Quality Plans/ Commissioning procedures/ O&M manuals/ as built drawings after E&C of all equipment/ PG test procedures/ Testing Procedures from BHEL/ NTPC/ PVUNL in time and shall plan the activities accordingly.

Any additional items required for the completeness and satisfactory performance of the Ash Handling system though not explicitly mentioned in Mechanical, Electrical, C&I, Civil scope & works etc in this specification shall also be in Bidder's scope of supply & works.

4.1 DESIGN BASIS AND INPUTS

ASH COLLECTION DATA AT BMCR (Input as per BHEL-Trichy)

As per Ash collection data the following percentages of Ash collection is considered for system sizing.

1. Fuel and Ash Quantities:

		Design Coal	Worst Coal
Coal fired at 100% BMCR	t/h	565	680
Ash in coal	%	36	42



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Ash generated	t/h	204	286
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2. Ash distribution data -t/h (BMCR) Per Boiler @

Furnace Bottom Hoppers	25 %	51	71.5
Economizer Hoppers	5 %	10.2	14.3
Economizer outlet duct hoppers	5 %	10.2	14.3
SCR duct Hopper	8 %	16.3	22.9
Air Preheater Hoppers	5 %	10.2	14.3
ESP Hoppers (including 5% for duct hoppers)	90 %	183.6	257.4

3. Sieve Analysis of Fly-Ash (% by weight) (Before ESP & SCR not in operation)

Less than 10 microns	5-25
10 - 30 microns	10-25
30 - 50 microns	5-15
50 - 70 microns	5-15
70 - 90 microns	5-10
90 - 100 microns	4-10
Greater than 110 microns	25-40

Additional Information

Description	Temp. °C	Pressure mmWc	No. of Hoppers	Elevation of Hopper Bottom (m)
Furnace Bottom Ash Hoppers	1100	-40	1	14
Economizer Hoppers	380	-100	4	23
Economizer outlet duct Hoppers	380	-100	6 + 6	35.87
SCR duct Hopper	380	-350	6 + 6	35.87
Air Preheater Hoppers	150	-470	2 + 2	3.5
AH-ESP Duct Hoppers	150	-505	4 + 4	3.5
ESP Hoppers	150	-535	120	3.5

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4.2 SYSTEM DESCRIPTION

1) Dry Bottom Ash Handling System

The Bottom Ash Handling System shall be provided to extract, cool to 200°C, grind, transport in a dry form of the hot bottom ash which falls down onto bottom ash hopper and conveyed up to an Intermediate bottom ash silo. The structural silo shall be designed to handle 200°C temperature of bottom ash as input. From the BA intermediate silo the bottom ash will be conveyed by bottom ash belt conveyor to main BA Silo by others. Maximum temperature of the bottom ash discharged to outgoing belt ash conveyor shall not exceed 150 Deg.C. **Bidder shall follow the division of work with dry bottom ash vendor as guideline for scope between bidder and dry bottom ash vendor.** Further complete details to be referred in the NTPC specification.

2) Economizer Hopper & Economizer Outlet Duct Hopper Ash Handling System

Ash collected in Economizer hoppers and Economizer outlet duct hopper shall be removed continuously in dry form pneumatically and shall be discharged into the Bottom Ash IM (Intermediate) Silo. From the BA intermediate silo, the Eco and Eco outlet duct ash along with bottom ash will be conveyed by bottom ash belt conveyor to main BA Silo by others. Further complete details to be referred in the NTPC specification.

3) Dry Bottom Ash and ECO Ash Storage System

- i) Total Three (3) nos. bottom ash intermediate storage silos are envisaged for three units. Each silo shall have the minimum effective capacity of 450MT. For each of the intermediate storage BA silos, three (3) outlets at the bottom shall be provided. Further complete details to be referred in the NTPC specification.
- ii) Total Three (3) nos. bottom ash storage silos are envisaged near plant boundary. Each silo shall have the minimum effective capacity as specified elsewhere. For each of the main storage BA silos, four (4) outlets at the bottom shall be provided. Further complete details to be referred in the NTPC specification.

4) Dry Fly Ash Conveying and Transportation System :

Dry fly ash handling system consists of ash handling system below ESP, SCR, DUCT & APH hoppers. Two stage pressure conveying system shall be provided. First stage shall include conveying of dry fly ash from ESP, SCR, DUCT & APH hoppers to the Fly Ash Intermediate Silo. Each FA intermediate silo shall have the minimum effective capacity of 850MT Here it may be noted that SCR, APH, Duct hopper ash shall be conveyed pneumatically to local intermediate surge hopper first and then to the fly ash intermediate silo. Second stage shall have transportation of fly ash shall from FA Intermediate Silos to the main Fly ash storage silos. Further complete details to be referred in the NTPC specification.

5) Instrument Air System

The instrument air requirement for ash handling plant shall be catered by 6 Nos. (3W+3SB) Oil free screw type Instrument Air Compressors (water cooled) in the Main



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Plant area and 2 Nos. (1W+1SB) Oil free screw type Instrument Air Compressors (water cooled) in Silo area for all three units.

6) Common Water System

The water requirement for the Ash conditioning system in bottom ash intermediate silo area and main ash silo area shall be met through water pumps as detailed elsewhere.

The flow scheme may be referred for water distribution.

7) Water Facilities

Cooling water distribution system from terminal point as specified elsewhere shall be provided to meet cooling water requirements of various air compressors intercoolers, after coolers, water jacket surge hoppers below SCR, Eco, Eco outlet hoppers etc. The cooling water system shall be operated in a close cycle.

Service water and drinking distribution system from terminal point as specified elsewhere shall be provided to meet the water requirements for various items like ash conditioners, dry bottom ash conveyor quenching, toilet etc.

8) Layout Requirements

Bidder shall refer NTPC specification for details for layout requirement.

Salient points are:

- (i) The Bidder shall consider the following parameters for AHP compressor houses, Silo Utility Building.

Minimum clear working space around the equipment shall be 1200 mm:

- a) In case of vertical suction / discharge pumps, the clear space shall be distance between edges of pedestals of adjacent pumps & the same shall be 1200 mm.
 - b) In case of horizontal/suction discharge pumps distance between outer of suction pipe of one pump & outer of discharge pipe of another pump shall be 1200 mm minimum.
 - c) Distance between inside face of column to edge of pump/pedestal shall be 1200 mm minimum.
- ii) Suction & discharge header shall be routed inside/outside the building.
- iii) In case of two (2) rows of pumps/equipment located in parallel, minimum distance between the equipment shall be meet the following criteria.
- a) Clear distance between edges of pedestals/motors of pump located parallel shall be 2000mm.
 - b) In case of space provided is acting as the handling space for the equipment by overhead crane the space shall be maximum size of equipment being handled plus the clearance of 500 mm minimum on either side with the stationary equipment.

- c) Withdrawal spaces of equipment.
- iv) Provision of minimum 550 mm clear walkway at crane rail level on both the side of the building.
- v) Building height shall take care of the following parameters
 - a) Head room for the piping/cabling shall be 2500 mm (minimum).
 - b) In case of handling of the equipment one over the other, the clearance between moving & stationary equipment shall be 500 mm (minimum).
 - c) In case of handling of the equipment on the side of the other equipment, ground clearance of moving equipment shall be 2500 mm (minimum).
 - d) Head room of 2100 mm over EOT crane rail level walkways. Pipes & cables shall be routed over ground inside/outside the building.
- vi) No pipe trenches are to be routed inside or outside the building. However, cable slits can be provided for routing of cables from the overhead cable trays to the respective motor of the equipment cable slits shall be finished to surrounding floor level with adequate cushioning of sand.
- vii) One maintenance bay of 6m (minimum) x the width of the building shall be provided.
- Viii) Two (2) nos. of rolling shutter of size 4000 x 4000 mm (min) shall be provided one at the entrance and the other at exit of maintenance bay. In case entrance & exit of maintenance bay is common i.e. on the same side, only one rolling shutter of size 4000 x 4000 can be provided.
- ix) Valves shall be located such that they are accessible from the regular floor of the building, as far as possible. Valve operating platforms along with approach ladder/cage ladder shall be provided for the valves which are not accessible from the floor of the building.
- x) Each equipment room shall be provided with alternative exits in case of fire/accidents as per requirement of factories act and statutory bodies/insurance companies.
- xi) Hoist maintenance platforms along with approach ladder shall be provided, preferably at the end of the building. Any maintenance platforms/supporting structure required for ash handling facilities in the boiler envelope shall also be provided by the contractor.
- xii) Fresh air supply and exhaust air fans shall be located at a minimum height of 3200 mm.
- xiii) Ash Handling MCC buildings by BHEL are presently proposed at the following locations and are to be finalized with Customer: -
 - i. MCC-1A near Dry Bottom Ash System for Unit#1
 - ii. MCC-1B near Dry Bottom Ash System for Unit#2
 - iii. MCC-1C near Dry Bottom Ash System for Unit#3
 - iv. MCC-2 near Main FA and BA Silos
 - v. MCC-3 near AHP Compressor House #1 and 2



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xiii) AHP pipe rack shall be designed to support cable trays also as per BHEL requirements.

6.1) General

- Bidder shall provide grating to cover the complete sump for all sumps including sumps in silo area. Further the grating platforms required in any of the buildings housing ash handling system equipment shall also be supplied by the bidder including the structural steel supports. The exact details of these platforms shall be decided during detailed engineering.
- All the buildings shall be provided with columns only at periphery without any intermediate columns.

4.4 SCOPE OF SUPPLY

- Bidders should refer to NIT specifications for complete scope details and BOQ. Bidder has to envisage & include any items/ equipment which are necessary as per design requirement and required for completeness of ash handling system for smooth & efficient operation of the plant at the time of bidding. The same shall be indicated in the technical offer being submitted.
- Air conditioning system (AHP MCC 1,2,3,4&5) and ventilation system (AHP MCC 1,2,3,4&5,AHP compressor house 1&2,Silo utility building, Toilets in AHP buildings) for complete ash handling system is in Bidder's scope. For further details, NTPC specification of AC and Ventilation system shall be referred. Tentative dimension of MCC buildings are:

Sl	MCC Room	Ventilation Required			AC Required		
		Length (Mtrs)	Width (Mtrs)	Height (Mtrs)	Length (Mtrs)	Width (Mtrs)	Height (Mtrs)
1	AHP MCC-1	24	7.5	5	12	6	4
2	AHP MCC-2	24	7.5	5	12	6	4
3	AHP MCC-3	24	7.5	5	12	6	4
4	AHP MCC-4	60	9.5	5	30	7	4
5	AHP MCC-5	24	8	5	12	6	4

- Any additional items required for the completeness of the Ash handling system shall be in the scope of Bidder. At no point of time BHEL would supply any item for making the system complete. It is the total responsibility of the bidder to make the system complete before handing over.
- If the system is not working properly or the system has some inherent design flaws, in such a case the successful bidder will be liable to correct the system and BHEL's decision will be final and binding in such cases. Also the system has to be designed taking worst case scenario into account if nothing is mentioned in the technical specifications furnished by BHEL/NTPC.



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- Statutory Clearance: Bidder shall obtain all the statutory clearances along with required fees to be remitted. BHEL may extend necessary assistance to the extent possible in this regard.
- Bidder shall co-ordinate & attend meetings with customer and also with other units of BHEL for finalizing the AHP Layout, drawing approval and for any other input information as required.
- Bidder shall participate in the Monthly progress review meetings along with progress reports and technical discussions at BHEL HQ/Customer's place/Patratu Site office. For Technical discussions regarding any erection issues related to erection drawings/supplies, any modification at site due to site conditions, bidder shall depute concerned engineers to site/customer place to resolve the issue as well as submission of related revised drawings. As built drawings shall be submitted by the successful bidder after visiting the site from time to time by their engineering personnel to note the modifications and incorporate in drawings.
- Comprehensive L-2 list of sub-vendors shall be submitted along with the offer and the same shall be submitted to NTPC for approval.
- Approved Sub-vendor list for Electrical, C&I items is enclosed in ANNEX-11. Bidders shall submit the list of sub vendors for NTPC's approval for additional items not present in the list.
- **3D modeling of complete AHP buildings, Fly ash main and intermediate silos, Bottom ash Main and intermediate silos, AHP pipe racks shall be carried out by bidder using PDMs software. Along with GA/OGA drawings the 3D modeled drawings shall also be submitted for approval.**
- **3D Modeling of 5no AHP MCC buildings (by BHEL) shall also be in bidder's scope. BHEL shall provide 2D AutoCAD drawings as inputs for 3D modeling and integration by bidder. MCC buildings shall be designed and constructed by BHEL.**
- Bidder shall furnish the L-2 project schedule indicating various milestones and constraints in MS PROJECT / PRIMAVERA, along with the bid. The successful bidder shall furnish the L-3 project schedule in line with the L-2 schedule after award of the contract.
- Project monitoring & execution team dedicated for this project including the organization chart till completion of the project shall be furnished by successful bidder.

4.5 The following points also to be noted by bidder:

- Dry bottom ash system and transportation shall be as per NIT ash flow diagram.
- Dry fly ash evacuation and transportation system shall be as per NIT ash flow diagram.
- 1st stage and 2nd stage Pressure conveying system shall be designed for ash collection data furnished in the specification.
- Number of cycles of operation per ash conveying line (Fly ash pressure conveying system) shall not exceed 10 cycles per hour during normal mode and 15 cycles per hour during emergency mode.



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- System shall be designed to operate satisfactorily at designed rate considering outage of first two fields of each pass of ESP. The size of vessels of 1st three fields shall be same. The filling efficiency of each vessel shall be considered as 75%.
- The pneumatic connector fittings used for instrument air and conveying air tubing connections inside/outside pneumatic panel shall be quick connectors with sealing ring/lock nut. Push fit or push on connectors shall not be acceptable.
- Each vent filter/bag filter at FA intermediate silo/Main FA Silo/BA intermediate silo/Main BA Silo must have a DP gauge and DP switch.
- SS orifices as required for water/air balancing shall be in bidder's scope.
- Air control valves/Pressure regulator shall be provided for pressure conveying system.
- Continuous fluidization of all fluidizing pads inside the FA intermediate silo and main FA silo shall be considered.
- Each pneumatic panel shall be equipped with air filter & lubricator.
- Cast basalt bends, sleeve coupling and expansion joints for ash conveying pipes shall be considered.
- Manual vent valve of suitable size (min 50 NB for 1st four fields of ESP vessels and min 25 NB for last fields of ESP/APH/duct hopper vessels) should be provided in all the vessels.
- The pneumatic operated vent valves shall also be provided in the vessels of 1st four fields of ESP hoppers. The vent lines shall be combined in a header and shall be connected to inlet of ESP funnel. This arrangement shall be followed per pass of ESP.
- The fluidizing blowers for fly ash intermediate and main fly ash Silo shall be designed for continuous fluidization of all fluidizing pads inside the silo.
- The fluidizing blowers for intermediate surge hopper for SCR, APH, duct ash shall be designed for continuous fluidization of all fluidizing pads inside the hopper.
- The Fly ash pipes shall be supported on staircases for reaching to top of silo.
- Power & control Cable trays shall also be supported on staircase for routing to Silo operating floor and silo top
- Instrument air supply shall be as per enclosed flow scheme.
- The air dryer capacity shall be 1.25 times the capacity of instrument air compressor and head requirement shall be 1kg/cm² more than the compressor discharge pressure.
- Each air dryer must have a Dew Point indicator and transmitter.
- Capacity of IA compressor at main plant and silo area shall be minimum 1200 m³/hr.
- SS orifices as required for water balancing in ash conditioner, seal water lines shall be in bidder's scope.
- Pipe Sleeves (for overflow, drain and suction pipes) for water tank shall be supplied by bidder.
- Hydro test of all water pipes at 2 times the working pressure or at 1.5 times the design pressure whichever is higher shall be done by the bidder.
- Except for the items specifically excluded in the specification, all other items required for the completion of the system shall be in the scope of the bidder.

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4.6 GENERAL SCOPE OF WORK

- The design, manufacture, inspection and testing of the equipment shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed and shall also confirm to the latest edition of Indian and other international standards and codes. Nothing in this specification shall be construed to relieve the contractor of the required statutory responsibility.
- In case of any ambiguity, conflict in the standard & specification &/or interpretation of clauses in this enquiry spec. and its enclosures the decision of BHEL shall be final and binding and any change due to this shall have no price implication on BHEL and shall have to be absorbed by successful bidder.
- All details required for civil drawings like insert plates, support structures, beams etc. whose supply shall be in the scope of bidder shall be clearly shown in GA drawing itself. Bidder shall ensure the correctness of civil assignment drawings which shall be an input for BHEL's civil design agency & structural designer. Any issues like cutting/chipping of floors, beams shall not be permitted. Any additional civil works arising if missed out things in civil assignment drawing prepared by the bidder like pedestal, foundation etc. shall have to be taken care by the bidder without any cost implication to BHEL and engaging his own resources.
- The Erection drawings of both structures and Mechanical items and fabrication drawings shall have all minute details. Bidder shall be responsible for any details that is missed out and is found during erection time and Bidder shall correct the same without any cost implication to BHEL.
- Design and layout of all buildings is in the scope of successful bidder.
- The layout of various air/water piping for the Ash Handling System shall ensure that all valves are located such as to be at conveniently accessible positions. Otherwise suitable access/maintenance platforms shall be provided for the valves/field instruments under the bidder's scope.
- The minimum headroom as required at the rail track crossings shall be as per Indian Railway requirements. The Bidder shall obtain necessary clearances from Indian Railway authorities in such cases.
- Inspection windows shall be provided at suitable locations.
- All access/maintenance platforms (hand rails / toe guard) including provision of secondary structural supports at any level as applicable for operation/maintenance of ash handling equipment are in bidder's scope.
- Bidder shall consider all necessary equipment, mountings, accessories, fittings etc. in the scope for making the system complete in all respects.
- Maintenance platform of minimum 1m width with handrails and access ladders shall be provided below hoppers of economizer, economiser duct, SCR, APH and Duct and all around BA hopper. Supports from the boiler building for the same to be considered in bidder's scope.



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- Minimum rear space for local panels and distribution boards shall be sufficient from the nearest obstruction. Cabling shall be done clearing any interference between collars, greasing points and dust collection. There shall be minimum headroom below runoff cable trays. Local control panels requiring operator's attention shall not be located in dust prone areas. Local panels in each area shall be housed in a dust proof cabin to minimize dust nuisance.
- Facilities for carrying out online and off-line maintenance of Ash Handling System and auxiliaries shall be provided. In general, this should include adequate handling equipment, working space, platforms and safety devices.
- All pipe joints inside pump houses shall be flanged type with suitable gaskets and shall be provided by bidder.
- All pads, shims plates, resilient pads of neoprene rubber etc. is in bidder's scope.
- The Contractor shall be responsible for providing all materials, equipment and services, specified or otherwise (unless specifically excluded) which are required to fulfil the intent of ensuring operability and the reliability of the complete system covered under this specification.
- Consumables like lubricants, oils, grease etc. for initial flushing, first fill and initial operation with topping up to successful demonstration of Commercial Operation Declaration (COD) are in bidder's scope.
- Supply of grouting cement and grouting of all mechanical equipment / items (including free issue items of BHEL if any) and its drives. Grouting of all the bases of equipment, minor chipping & make up of pedestals / pockets shall be in scope of Bidder. BHEL / BHEL's civil contractors shall provide only the foundation pockets for pedestals (wherever necessary) as per mech. GA drawings.
- Minor chipping, if required i.e up to 50mm thick, micro levelling and providing shim plates, support structures etc. for erection of machines, equipment/items shall be in the scope of bidder.
- Preparation of protocols and getting signed from customer for all the equipment in Bidder's scope.
- Rust prevention after inspection at shop floor before dispatch and also at site (as applicable) shall be in bidder's scope.
- Necessary provisions shall be considered in the equipment/items/systems which are in bidder's scope for integrating with other equipment/systems/items which are part of other contractor's scope.
- Alignment of all drive system, including free issue items of BHEL shall be in the bidder's scope.
- All Material of construction for all equipment shall be subject to BHEL/ NTPC approval during detail engineering.
- All fluidizing air pipes shall be properly insulated at all areas.
- SS liners for hoppers, Bottom ash Silos, Fly ash silos etc. shall be in bidder's scope.



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- Control & Instrumentation of Ash handling system. All field mounted & panel mounted instruments as per approved flow diagram, P&ID, control & operation philosophy during detail engineering shall be supplied by Bidder for AHP package.
- Base frames and all mounting hardware including bolts and nuts for all equipment & electrical panels and for associated motors shall be in the scope of Bidder.
- Equipment handling facilities comprising of EOT cranes, electric hoists, chain pulley blocks as required for the complete Ash Handling system shall be in the scope of Bidder.
- Each equipment shall be provided with suitable lifting attachments, supports, lifting lugs, eye bolts, etc. to facilitate maintenance.
- Bidder to also note, that surface preparation and painting (including final coat after erection & commissioning) of all equipment, pipes & structures supplied by successful bidder are to be done by bidder as per NTPC procedure. Finish painting at site after erection and commissioning of all equipment, pipes & structure supplied by BHEL as free issue is also to be included in bidder's scope.
- Bidder shall strictly follow and adhere to the guidelines laid down in the enclosed BHEL's health, safety and Environment manual (HSE).
- Quality of effluent outgoing from the plant shall conform to latest norms of Environment Pollution Control.
- Supply and Erection of Electro forged gratings in pipe racks, all type of sumps, walkways, platforms and any other structural steel works of Ash handling system shall be in bidder's scope (refer Scope matrix).
- Bidder should provide the list of recommended spares for 3 years of normal operation of the ash handling plant in their technical offer. This list shall also take into consideration of the mandatory spares specified in this Specification and should be independent of the list of the mandatory spares. The NTPC/BHEL reserves the right to buy any or all of the recommended spares as per the requirement. The recommended spares shall be delivered at project site as and when required.
- The bidder's supply shall also include Special tools and tackles, Start-up & Commissioning spares that are necessary to ensure safe and reliable operation of the plant during start up, continuous running, shut down and emergency conditions, even if these are not explicitly mentioned in this specification. **Bidder to submit the list of tools/tackles, Start-up & Commissioning spares list used for the package, along with the offer. No items/accessories, etc. shall be supplied by BHEL during any period of the contract.**
- The contractor shall be responsible for making all connections at terminal points and for supplying any necessary jointing material, connectors, nuts, bolts, etc.

4.7 OPEN & CLOSED STORAGE YARD

- ♦ Bidder to include in their package design & construction of 1 no. semi- permanent store shed for use of BHEL for storing equipment of size not less than 450 sq M with required brick wall side covering, GI sheet roof covering & rolling shutters & windows as approved by BHEL. Bidder shall ensure that the size of the closed



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storage shed is capable of storing heavy equipment required for this package and shall be suitable for movement of hydra.

- ◆ Bidder to include in their package open storage yard of size not less than 3000 sq. m with 230 mm thick compacted WBM with required fencing. Required sleepers for keeping the equipment, pipes & tarpaulin cover to be arranged for outdoor storage of pipes and outdoor equipment & facilities during temporary storage.
- ◆ Bidder to include in their package 1 no. of fully air conditioned SINTEX or approved /equivalent make bunk house for use as office along with air conditioner, fans, illumination, toilets, required facilities etc. excluding furniture of size not less than 30 sq M.

Material storage Instructions:

- ❖ Storekeeper - 1 member (per shift)
- ❖ Security person round the clock (min. 2 person / shift)

1. Bidder shall necessarily comply and ensure following w.r.t **Storage & Preservation** for main supply material & mandatory spares at site: -

- a) Prepare and submit the "Dispatch & Receipt Reconciliation Report".
- b) Make periodic condition checks for the safety of boxes/items during storage of main material, mandatory spares etc.
- c) Maintain requisite inventory records.
- d) Bidder has to keep the material properly as per storage WI. In case bidder fails to adhere the WI and any consequential damage/missing items due to non-adherence of storage WI, No insurance claim can be entertained by BHEL and items shall be replaced by vendor without cost implication to BHEL.
- e) Monthly inspection report to be submitted by successful bidder to BHEL site-in charge / Resident Manager for storage and preservation of materials kept under closed / open stores as part of RAB. In case bidder fails to report the status in anyone of the month, further any damages reported in the subsequent month will not be entertained by BHEL and entire item has to be supplied by bidder at their own cost. No insurance claim shall be entertained.
- f) Bidder has to report the damage/theft/fire, etc to Resident Manager, BHEL-ISG immediately along with detailed incident report, Joint inspection report by bidder/BHEL, photograph, copy of invoice with received seal, etc to report to insurance agency within a week time of incident followed by FIR. If, bidder fails to produce the document in the stipulated time as mentioned above, BHEL will not entertain for any insurance claim and entire items are to be supplied by bidder without additional cost to BHEL.

4.8 EXCLUSIONS

No exclusion for Mechanical items/systems for Ash handling plant. Regarding exclusion for Electrical, C&I, Civil and structural Bidder shall refer **Scope matrix Annexure-9 and 10.**

4.9 TERMINAL POINTS

The terminal points for the Ash Handling Plant are as follows:

- I) Starting
 - a) Boiler seal plate.
 - b) ECO, ECO outlet Duct, APH-ESP Duct, APH, ESP, SCR duct Hoppers' outlet flange.
 - c) Input water:
 1. Service water: -

(A) Near Silo utility building in main silo area. Subsequent valves (valve station) and piping for further distribution including for AHP MCC-2 building in Main Ash Silo area shall be provided by the bidder.

(B) Near bottom ash intermediate silo unit #1, 2&3 area. Subsequent valves (valve station) and piping for further distribution including for AHP MCC-1A, MCC-1B and MCC-1C buildings (3nos) in respective unit of Dry Bottom Ash Area shall be provided by the bidder.

(C) Service water: - Near AHP compressor house# 1 and 2. Subsequent valves (valve station) and piping for further distribution including for AHP MCC-3 building near AHP Compressor house shall be provided by the bidder
 2. Clarified cooling Water: Near Boiler Unit#1, 2 area for SCR, Eco, Eco outlet hoppers. Subsequent valves (valve station) and piping shall be provided by the bidder.
 3. DMCW water:-Near AHP compressor house# 1 and 2. Subsequent valves (valve station) and piping shall be provided by the bidder.
 - d) Potable water: - Near AHP compressor house# 1 and 2, Bottom Ash Intermediate Silo-1, Silo utility building area. Subsequent valves (valve station) and piping for further distribution including for the following buildings (i) AHP MCC-1A (ii) AHP MCC-1B (iii) AHP MCC-1C building in Dry Bottom Ash area (iv) AHP MCC-2 in Main Silo area (v) AHP MCC-3 near Compressor house #1 &2 shall be provided by the bidder
- II) Ending
 - a) For Dry fly Ash (ESP, SCR, APH, AH-ESP Duct) - Outlet of Unloading spout below fly ash intermediate silo to truck feeding.
 - b) For Dry fly Ash (ESP, SCR, APH, AH-ESP Duct) - Outlet of ash conditioner and Unloading spout below main fly ash silo to truck and wagon feeding.



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- c) For Dry fly Ash (ESP, SCR, APH, AH-ESP Duct) - Outlet of ash conditioner discharge chute to ash belt conveyor below main fly ash silo.
- d) For Dry bottom Ash (Boiler, Eco, Eco outlet duct) – Outlet of Vibrating feeder discharge chute to ash belt conveyor below bottom ash intermediate silo.
- e) For Dry bottom Ash (Boiler, Eco, Eco outlet duct) – Outlet of ash conditioner discharge chute below bottom ash intermediate silo to truck feeding.
- f) For Dry bottom Ash (Boiler, Eco, Eco outlet duct) - Outlet of Vibrating feeder discharge chute to truck and wagon feeding below main bottom ash silo.
- g) For Dry bottom Ash (Boiler, Eco, Eco outlet duct) - Outlet of Vibrating feeder discharge chute to ash belt conveyor below main bottom ash silo.

4.10 GENERAL NOTES TO BIDDERS:

- BHEL reserves the right to request for any additional information and also reserves the right to reject the proposal of any bidder, if in the opinion of BHEL, qualification data is incomplete or the bidder is found not qualified to satisfactorily perform the works.
- Notwithstanding anything stated above, BHEL reserves the right to assess bidder's capability and capacity to perform, should the circumstances warrant such assessment in the overall interest of the Project.
- The bid shall be complete in all respects and shall necessarily contain but not limited to Technical description, Technical data sheets of equipment and systems, Schematic diagrams, System Process & Instrumentation Diagrams (P&ID), Guarantee declaration schedules. Spares shall meet the project scope and technical specification requirement.
- The bid shall also include Price schedules, Bidder's Qualifications, Eligibility and Conformity of the facilities, list of special Tools & Tackles. Sub-Bidders proposed by the bidder shall also be indicated.
- Bidder shall provide details of important conditions, Deviations (with respect to Technical Specifications) if any, local representatives, deemed export benefits, Erection Tools & Plants, Bought Out Items, Quality Assurance programme, Project Schedule with Milestone Schedule and Additional Information if any.
- BHEL reserves the right of demanding any additional information and clarification from the Bidder after submission of his bid for examination and evaluation of bid, in which case, the Bidder shall furnish the same.
- Bidder shall understand limitations/ constraints and decide the optimal route based on the location of the buildings etc.
- The system shall generally be as per the drawings & specification requirement in the enclosed enquiry specification.
- Bidders shall submit the offer strictly in line with the technical specifications and instructions provided in this document. In case the requirements mentioned in

these documents are not complied with, the offers may be considered as incomplete and would become liable for rejection.

- The bolted structures for Ash Handling System shall be supplied by the Bidder, for which the load data has to be submitted by the Bidder during detail engineering. The interconnection of various equipment and alignment of the same during erection & commissioning has to be carried out by the Bidder and specifically brought out in Scope Matrix.
- Bidder to note that the placement of PO is subjected to the Bidder approval from NTPC. Sub vendors/ Makes of all the items, equipment/components are also subjected to NTPC/ BHEL approval.
- All Bidders to submit their credentials and formats attached in Technical requirements and 3K attachments along with offer in 3 sets for submission to NTPC for vendor approval. If NTPC/ BHEL does not approve any vendor the price bid of the vendor will not be opened. Further, on obtaining the order, the Successful Vendor shall submit his reputed sub vendor list, reputed makes/data sheets of all equipment/components & documents as desired by NTPC for approval. If any of the sub vendor including his own make, does not have the approval of NTPC/ BHEL, the same may be replaced with another NTPC approved sub Vendor without any price implications to BHEL. It is the complete responsibility of the bidder to obtain "sub vendor approval" from NTPC for all equipment & components being supplied. Any delay in sub vendor's approval should not affect the project schedule. All sub-vendor approvals should be obtained within one year from the date of LOA.
- The NTPC Technical specification, General Technical Specifications/ Requirements, Amendments and BHEL GCC, HSE given with this specification, which shall be read with this technical specification and shall form part of the tender.
- All Technical Specifications, Annexure, Amendments and NTPC/ BHEL specifications shall be signed and stamped (Company seal) by authorized signatory on all pages and clearly mentioning each clause under following two categories to avoid any ambiguity in scope understanding & the scope division as a technical offer during bidding.
 - a. "Accepted without deviation and considered in scope of work"
 - b. "Not considered in scope of work"
 Offers without same shall be considered as incomplete.
- Bidders to note that deviations, if any, must be mentioned only in deviation sheet given along with the NIT documents. Apart from this any deviations mentioned elsewhere in the offer shall not be taken into consideration.
- Bidder to submit the Data sheets duly filled in and submitted along with offer. Data sheets attached in Annexure- 17.

4.11 ELECTRICAL SCOPE OF WORK

Electrical and C&I Scope Matrix has been added as Annexure- 10.

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4.12 CIVIL AND STRUCTURAL SCOPE OF WORK.

Civil and structural Scope Matrix has been enclosed as **Annexure-9**.

SECTION – 5.0

5.0 ERECTION & COMMISSIONING, OPERATION & MAINTENANCE.

5.1 ERECTION& COMMISSIONING

- 1) For Erection and commissioning works and hand over of entire Ash handling plant, bidder shall depute and maintain minimum five graduate engineers (consisting of Mechanical & Electrical) in addition to Site-in-charge and two diploma engineers having requisite relevant experience till handing over of the systems to the customer, as per project requirement & progress.
- 2) During such erection work, bidder shall be responsible to ensure correct implementation of their design of civil and structural works at site.
- 3) Bidder shall depute required manpower for stores management including one Stores supervisor and Security.
- 4) At least two numbers qualified graduates for site commercial coordination shall be made available at site for utilizing their services by BHEL, if not complied BHEL will engage directly and recover monthly charges as per commercial part of the enquiry specification
- 5) Suitable (minimum 1 no.) minimum 50 T capacity with 100 ft. boom crawler crane & suitable torque wrench for tightening HSFG bolt /HT bolts to be mobilized for erection. Wherever required in the absence of inserts plates etc. HILTI make or any other approved anchor fasteners supply & fixing to be included in the scope of bidder.
- 6) Erection of all items shall be in line with the “Erection & Commissioning manual”
- 7) Cost of repair/replacement of damaged equipment /parts, if any, including material & maintenance works shall be borne by AHP Main package supplier

NOTE:

- **Bidders have to give their Organization chart for the site activities along with the offer.**
- **In case Bidder fails to maintain the minimum manpower/site staff at site till project completion, suitable pro-rata deductions as per BHEL prevailing rates, shall be recovered from the Bidder.**
- Please refer complete Erection Condition of Contract as per NIT specification. Bidder shall strictly adhere to the same and follow the erection & commissioning terms and conditions.
- Required water (through tankers/bore wells) for leakage testing of Bottom Ash hopper shall be arranged by bidder in the absence of service water at the nearest place, without any cost implication to BHEL.



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- Calibration of instruments before commissioning is included in bidder 'scope.
- Cleaning of any debris produced by the bidder during Erection and Commissioning shall be done immediately at each front.
- Drilling of required holes in the civil & steel structures for erection of pipes, dives, equipment shall be in bidder's scope.
- Provision of any temporary supports/platforms required for E&C of mechanical equipment / items shall be in bidder's scope.
- Bidder shall make their own arrangements well in advance for heavy erection equipment (like bigger cranes) that are required for erection of equipment which are at higher height and the following shall be considered and required to be available at site as necessary.
 - a) Two Nos. Hydra - permanently stationed at site from start till end of the project
 - b) Longer boom crane of 26m height as and when required
 - c) If trailor is required, same may be arranged as and when required.
- Whenever power fails, DG back up is required. DG set to be arranged and kept as standby by bidder, whenever required. Also, for carrying out works where power sockets are not available.

5.2 OPERATION AND MAINTENANCE TILL HANDING OVER

5.2.1 Scope of work for operation & Maintenance of the Plant:

Bidders Operation and Maintenance service shall be applicable after readiness of Complete Ash Handling System with Bottom Ash, Coarse Ash and Fly Ash.

The bidder shall be responsible to carry out the **"round the clock trouble free operation"** of the complete Ash Handling System (DCS based) for a period of six months of plants. Prior intimation for start of coal firing shall be given to bidder one or two days before.

The above stated six month shall not be continuous and shall be unequally distributed over a span of 18 months from first coal firing date of any of the units of plant.

One month of the O&M services mean operation and maintenance of any one of the total 3 units for one month. It is possible that in a one particular month of O&M services, any one unit shall run for 15days and balance 15 days of the month, any other unit may run. In such case, bidder shall claim O&M for one month only.

In case two units are running in one month, bidder shall claim for two months of O&M.

In addition to operation and maintenance of the items supplied by the bidder, the bidder is also responsible to carry out the operation and maintenance of free issue supplied items by BHEL. Maintenance/repair/replacement of items like valves, pipes, dry ash conveyor, compressors, water pumps, Motors, Field instruments etc. and their components shall also be in the scope of the bidder.

All other consumables (gasket, rope, diesel, rustoline, waste cloth, lapping paste, jute, emery papers, welding electrodes, grinding wheel, hacksaw-blade, cutting gas, Electric items like Insulation Tape, Lugs, Fuses ,Push Buttons, Electrical contact cleaner etc.) required shall be also in the scope of the bidder.



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All tools, tackles, viz. chain pulley block, pulling & lifting equipment, Trolley, Crane, Hydra, Truck, Trailer, winch, wire rope, grinding machine, sling, D-shackle, Coupler etc. including precision measuring instruments, welding machine & single phase portable welding machine that may be essential to execute the job shall be arranged by the bidder at no extra cost to BHEL. Portable diesel generator machine will have to be arranged by the bidder for carrying out maintenance job outside the plant where power supply could not be available.

For electrical job, Megger (1 no.), Multimeter (02 nos.), Clamp meter (1 no.), Tester and screw driver set (02 nos.), Spanners/Pliers/Small tools kit (1 set)/Crimping tools for power and control cables/cutter (2 nos.)/ wire stripper (2 nos.)/Blower to be arranged by the bidder for each stage at no extra cost to BHEL.

Necessary shifting of materials, spares, equipment etc. from store to work site and unserviceable materials from work site to store/yard, is to be done by the bidder at their own cost.

The bidder must have adequate resources to undertake routine, preventive maintenance jobs of AHP. They should have adequate resources to mobilize the site for carrying out three to four jobs simultaneously without any delay.

Bidder has to compulsorily maintain log book for the O & M staff engaged for O&M jobs and submit to Engineer in charge for certification for realization of the bills. After certification of the bill by Engineer in charge of BHEL, bidder shall claim the amount after completion of minimum 30 days.

In case bidder does not engage required O& M staff with tools and tackles as specified in the specification, O& M staff shall be engaged by BHEL at their risk and cost on monthly basis for a minimum period of 06 months and amount incurred shall be debited from the bidder's bills.

Additional responsibility of the bidder:

The bidder shall also be responsible for following operational activities:

- i) Top up of oil/grease/lubricant as required during operation of plant shall be done by the bidder.
- ii) Eco and Eco outlet duct Hoppers, SCR Hoppers, APH Hoppers, Duct Hoppers & ESP Hoppers are to be ensured empty round the clock. In case of outage of ESP field due to accumulated ash in the ESP Hoppers, it will be the responsibility of the contractor to arrange evacuation of ash from the ESP Hoppers so that generation of the units does not get affected.
- iii) Bottom ash removal through dry ash conveyor of Bottom ash Hoppers to be carried out in each shift during coal firing of the boiler.
- iv) Removal of erection/technological waste which may come along with ash from BAH, ECO and Eco outlet duct, SCR, APH, DUCT and ESP hoppers during the operation of the plant shall be done by the bidder. Cleaning of ash from BAH ground floor area, SCR Hopper area, APH hopper area, Economizer Hopper area, ESP area, BA and FA intermediate area and BA and FA Silo area on regular basis and disposal of the same at specified location as directed by BHEL.
- v) The bidder should remove all the technical waste including ash in AHP area after each maintenance and operational activities to keep the place clean and according to the satisfaction of BHEL Engineer in charge within 3(three) days after completion of work, failing which BHEL will get the cleaning done at the risk and cost of the bidder.
- vi) In case there is choking due to formation of clinker in running condition of the Boiler, utmost effort is to be given to remove those clinkers. Necessary Safety arrangement as deemed fit is to be undertaken in course of removing clinkers.
- vii) The bidder shall be vigilant and take necessary measure to prevent overflow from seal water tank, ash water tank, drain sumps etc. to avoid discharge to the nearby drain.



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- viii) The bidder shall do the servicing of field instruments like Limit/Pressure/Temperature /Level switches, Pressure/Temperature/Level Gauges, Flow Gauges/indicators, transmitters, Solenoid valves, Cylinders, Air filters.
- ix) To maintain the daily log book for shift wise plant operations which will include activities e.g. complete evacuation of fly-ash hoppers, BA Hopper, Eco. SCR, APH & DUCT Hoppers. A copy of observation and recording of salient operational readings of the unit to be submitted by the bidder to the Engineer-in-charge of BHEL ISG for record and further processing.
- x) Housekeeping: Cleaning of all equipment and housekeeping to be carried out dedicatedly in total Ash Plant area and its office premises.
- xi) All routine, preventive, predictive and breakdown maintenance of equipment of Ash Handling Plant inclusive of BHEL supplied equipment.
- xii) Removal of all types of chocking in nozzles, pipes in ash disposal system.
- xiii) In case of dumping of ash from the hoppers (for reasons attributed to the bidder) on the floor, the same has to be cleaned by bidder. The ash has to be transported to the specified place by the bidder as per the instruction of the Engineer-in- charge.
- xiv) Fabrication and erection of platform/extra support for AHP area if felt necessary during operation and maintenance of the plant has to be done by the bidder. Materials like channels, beam, angle etc. as required shall be supplied by bidder and BHEL shall pay based on unit rate mentioned in price format.
- xv) Leakages/Spillages/Debris etc. generated on account of repairs during operation and maintenance of the plant at various locations in the ash handling system has to be collected, cleaned and disposed at designated area as marked by BHEL ISG.
- xvi) Transportation of new pipes, spares, equipment from stores to site including loading, unloading and return the damaged pipes, spares, equipment to the designated place in the store.
- xvii) To maintain the daily Maintenance log book in which details of overhauling / breakdown/maintenance of any equipment including replacement of spares/components to be recorded. Recording of any abnormality of equipment, malfunctioning of system of the AHP also to be noted in the Log book.

5.2.2 MANPOWER REQUIREMENT:

Bidder should have minimum man power for O&M of each unit of either stage-1 or stage -2 as follows:

Sl. No.	Manpower	Nos.	Remarks
1	Mechanical Engineer	1	General shift
2.	Electrical Engineer	1	General shift
2	Mechanical Supervisor	1	In each shift
5	Electrical supervisor	1	In each shift
3.	Console Operator	1	In each shift
4	Field Operator	04	In each shift
6	Electrician	1	In each shift
7	Technician /Fitter (Mech.)	2	General shift
8	Rigger Skilled	2	General shift
10	Welder	1	General shift
11	Gas cutter	1	General shift
12	Helper	2	General shift

Note:

1. If additional manpower is required for the operation and maintenance of the any of the unit, Bidder shall provide the same without any extra cost implication to BHEL.
2. The bidder shall take approval from Engineer-in charge of BHEL by submitting organization Chart of O&M staff for this site clearly indicating man power deployment with their educational background& experience with supporting documents.
3. EPF provisions for the workers shall be made by the bidder as per rule. Relevant documents regarding EPF for the workers of the bidder shall be submitted to the concerned authority before commencement of work.
4. The bidder shall be solely and wholly responsible for safety and security of workers engaged in the job and the BHEL property. In case of any accident the contractor shall pay proper compensation to the workers as per workmen's compensation act and repair/replace BHEL property at their own cost & arrangement. The bidder shall also make adequate provision of insurance for their workers at their own cost to cover them against the risk of accident.
5. The bidder and their workers engaged in the job shall follow all safety rules at the time of execution of work. It shall be responsibility of the bidder to supply all safety equipment as necessary to its O&M staff.
6. The bidder shall comply with all laws, rules & regulations of the land including but not limited to, i) Labour rules & Acts, ii) Factories Act, iii) Minimum wages Act, IV) Payment of Wages Act, v) Bonus Act, vi) EPF rules, vii) Contract Labour (Regulation & Abolition)Act as in vogue or comes into vogue from time to time. BHEL will be kept indemnified against any claim arising out of non-compliance of such Acts/rules.
7. The bidder shall not pay less than minimum wages to the workers under the Minimum Wages Act and the Govt. rules made there under subject to revision from time to time. The payment will be made to the workers in presence of the authorized representative of BHEL. The monthly payment is to be made on the 7th day of successive month. The bidder may change the place and time of payment to his workers under intimation to Engineer in charge of BHEL.
8. BHEL shall not be responsible in matters of employment of workers engaged in the job at any point of time. The bidder shall be fully responsible for his workers with regard to terms of employment of services. BHEL shall not be held responsible in any manner, whatsoever, in respect of workers engaged by the contractor for carrying out the works at site. Regarding engagement of workers preference should be given towards experienced and competent workers with bonafide testimonials.
9. Beyond general shift if any trouble/breakdown occurs in the plant, Maintenance team must reach the plant without any delay along with Engineer/Site In charge.
10. No Person from the list of manpower shall leave the plant site without prior permission from the Engineer in charge of BHEL.
11. However, in operation part, if any person is absent, substitute must be given immediately otherwise proportionate deduction will be made.
12. The replacement / substitute personnel for maintenance, manpower shall have the same educational qualification and experience.
13. If any additional manpower is required during O&M whatsoever under the scope of contract the same shall be made available by bidder in time within the cost. To cater the need of time bound maintenance jobs, the bidder shall depute additional manpower without any cost implication to BHEL
14. During execution of work if any personnel is found not suitable for the job or his presence inside powerhouse premises is felt undesirable, the personnel has to be replaced within 15 days.
15. BHEL will not be responsible for payment towards idle labor charges.

5.2.3 Minimum qualification & experience of personnel & manpower required



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Sl. No.	Category.	Educational qualification.	Work experience.
01.	Engineer (Mech/Elect.)	Degree / Diploma in Mech. & Elect Engg. from a recognized University/ college.	Min. Two(2) years of work experience for Degree holders and Min. Five (5) years of work experience for Diploma holders in Ash Handling system(wet & dry) and also having a working experience in DCS/PLC based Ash handling system of thermal power plant having unit capacity not less than 210 MW.
02.	Supervisor (Mech. /Elect.)	Diploma in Mech./Elect Engg. from a recognized University.	Min. two (2) years of working experience in Ash Handling system of large thermal power plant of unit capacity not less than 210 MW.
03.	Console Operator.	Degree / Diploma in Mech. & Elect Engg. from a recognized University/ college.	Min. One (1) year of work experience for Degree holders and Min. Three (3) years of work experience in DCS/PLC based Ash handling system of thermal power plant having unit capacity not less than 210 MW.
04.	Field Operators.	ITI (Mech.)/Elect trade institute certificate from recognized institute.	Min. two (2) years of working experience in Ash Handling system of large thermal power plant of unit capacity not less than 210 MW.
05.	Technician/ Fitter(Mech.)	ITI (Mech.) trade institute certificate from recognized institute.	Min. two (2) years of working experience in industry /Ash Handling system
06.	Rigger	-----	Min. two (2) years of working experience in industry.
07.	Welder	-----	Min. two (2) years of working experience in industry.
08.	Gas cutter	-----	Min. two (2) years of working experience in industry.
09.	Electrician	-----	Min. five(5) years of working experience in Electrical and C&I.
10.	Helper	-----	

5.2.4 TOOLS & TACKLES, COMMISSIONING SPARES:

Bidder to include tools and tackles, Commissioning spares along with AHP package. The list of the same shall be furnished along with offer. Minimum requirements are as follows:

- Motorized winch- 2nos.
- DG set capable of running minimum 3 welding machines- 1 no.
- Hydra-1 no.
- Transport vehicle.



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- v. Chain pulley Block- 6 nos.
- vi. Welding machines- 8 Nos.
- vii. Gas cutting equipment including cylinders- 4 sets
- viii. Gas cutting torches- 8 sets
- ix. Grinding machines- 4 sets.
- x. Drilling machines- 3 sets.
- xi. Welding electrodes oven- 4 sets.
- xii. Tong tester- 3 sets.
- xiii. Submersible pump- 3 sets
- xiv. Calibrated Testing equipment like hydro test pump (1 nos.), pressure gauges (5 nos.), temperature gun (2 nos.), vibration measurement equipment (1 set), noise level measurement (1 nos.), Vernier caliper (1 nos.) tachometer (1set), etc.
- xv. Other items like wire rope, sling, D-shackle, Coupler etc. including precision measuring instruments, single phase portable welding machine, Megger (1 no.), Multimeter (02 nos.), Clamp meter (1 no.), Tester and screw driver set (02 nos.), Spanners/ Pliers/ Small tools kit (1 set)/ Crimping tools for power and control cables/ cutter (2 nos.)/ wire stripper (2 nos.)/Blower etc.

Each E&C Contractor should have the minimum tools & tackles mentioned above.

5.2.5 OPERATION & MAINTENANCE MANUAL:

1. O & M manual shall contain the following.
2. Principle of operation of the equipment.
3. Details of preventive / repair maintenance for equipment and accessories used.
4. Details about the general specifications, design capacities of equipment, their function.
5. Equipment Bidder's address, telephone nos., contacts person details to be furnished.
6. Required Dismantling devices, tools etc.,
7. List of DO's and DO NOT's.
8. Test certificates.
9. All drawings.
10. Calculations.
11. Storage and erection instructions.
12. Proper procedures & sequence of operation.
13. Details of consumable.

Note:

- a) All manual shall be supplied in proper bound books or in folders, preferably in A4 size.
- b) Prospective Bidder will submit the regular progress reports for self-manufactured & their bought out items equipment ordering /manufacturing status, drawings status once in fifteen days.

SECTION – 6.0

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6.0 DOCUMENTATION AND SPARES

6.1 DOCUMENTS, DATA SHEETS TO BE SUBMITTED ALONG WITH OFFER:

- Complete Load details and foundation plan with location of support columns of bottom ash hopper within the boiler foot print area.
- Technical data sheets to be submitted by the bidder have been enclosed as Annexure-17.
- Cooling air requirement for dry bottom ash system limited to BHEL maximum acceptable value.
- System capacities and all equipment ratings as per their scope of supply.
- Electrical Load list/Feeder list with type/rating/power requirement.
- Total water consumption (Consumptive & Non-consumptive) per shift.

Above documents are to be submitted mandatorily along with bid. Without the submission of these documents, acceptance of technical bid shall not be processed.

6.2 SPARES:

Contractors scope shall include Mandatory Spares of all equipment as mentioned in Annexure-12A and also Commissioning spares (ANNEX-12B). Special and separate packing & box-marking for items meant for mandatory spares including tools and tackles which are to be handed over directly to customer, is required. Mandatory spares shall be dispatched separately and not along with the main equipment, based on actual status of the project and clearance from site.

6.3 DRAWING / DOCUMENT DISTRIBUTION SCHEDULE

The number of copies/prints/CD-ROMs/manuals to be furnished for various types of document is as per NIT specification.

Note:

- List of drawings shall be furnished immediately after placing the order.
- All drawing and data sheet are to be submitted in standard sheets having approved title blocks. NTPC's and BHEL-ISG's name has to be incorporated in all the drawings.
- As far as possible, first angle projection shall be followed.
- Drawing shall be generally in A3 size. However, if inevitable, the size shall be A0, A1, and A2.
- Drawing shall be complete. Incomplete drawing shall not be accepted.
- All drawings submitted shall indicate the type, size, arrangement, weight of each component, breakdown for packing and shipping, the external connections, fixing arrangements required, the dimensions required for installation with other



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equipment and material, clearances required between various portions of the equipment and any other information that is relevant or requested for.

- Free hand drawing, lettering, overwriting etc., shall be totally avoided and the same shall be stenciled in ink.
- The drawings mentioned for approval are to be submitted for approval. If drawings are approved with comments, then the same shall be resubmitted after incorporating the comments.
- Test certificates shall invariably consist of details such as Name plate data, projects and NTPC's name.
- Test certificates shall be strictly in A4 size.
- Records of test results / readings etc., made during internal testing shall be available during testing/ inspection in NTPC's presence.
- All drawings and test certificates etc., shall be marked as "CERTIFIED" and signed by the competent authority on the Bidder's side.
- Submission of O & M manuals, as built drawings/ doc. shall be in the Bidder's scope.
- Successful bidder has to submit AUTOCAD drawings along with pdf copies.
- 3-D models compatible with PDMS software or PDMS software itself of the complete system and coordinating with BHEL other units for alignment will be in the scope of bidder. During detailed engineering bidders shall submit the same along with the GA/OGA drawings for approval.
- **Successful bidder shall furnish the detailed packing/shipment box details with information such as packing box size, type of packing, weight of each consignment, sequence no. of dispatch no. of consignment for each deliverable item against each billing break up units/ billable blocks.**
- Successful bidder shall submit "Storage Instructions" and "area required" for the storage (at site) for the entire equipment in bidder's scope of supply within 4 weeks from the date of LOI and the bidder shall ensure that the shipment list/Packing list and Storage Instructions are available at site before the items/equipment reach the site. Minimum area for storage yard is indicated in the price format.
- Successful bidder shall submit "Field Quality Plan for Receipt & storage " within 4 weeks from the date of LOI
- Successful bidder shall submit "Field Quality Plan for Erection & Commissioning" for all items including that of BHEL's Supply items, within 8 weeks from the date of LOI.
- Successful bidder shall submit "Erection & commissioning Manual" within 8 weeks from the date of LOI.
- Bidder shall furnish Erection and Commissioning manpower requirement, consumables, tools and tackles requirement for commissioning of the system.
- All Manuals shall be supplied in proper bound books or in folders.

SECTION – 7.0

7.0 FUNCTIONAL GUARANTEES



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7.1 Station Auxiliary Power Consumption

List of drives with corresponding weightage factors thereof for which power consumption is to be guaranteed is as per annexure-15. Liquidity damages shall be applied as per SCC on account of shortfall in auxiliary power consumption during PG test.

7.2 Performance guarantee

The parameters/capabilities to be demonstrated for various systems/ equipment shall as per NIT specification including cooling air requirement for dry bottom ash system. Liquidity damages shall be applied as per SCC on account of shortfall in equipment guaranteed parameters during PG test.

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NTPC TENDER SPECIFICATION

Sl No.	Description	Pages
1	Section I-V	267
2	Section VII-Book 1 of 3-Part 1	445
3	Section VII-Book 2 of 3	137
4	Section VII-Book 3 of 3-Part 1	149
5	Section VII-Book 3 of 3-Part 2	715
6	Attachment 3K	704
7	PART-A	540
8	PART-B BOOK 1 OF 6 (Vol. 1 of 2 _MECH)	568
9	PART-B BOOK 1 OF 6 (Vol. 2 of 2 _MECH)	523
10	PART-B BOOK 2 OF 6 (ELECT)	610
11	PART-B BOOK 3 OF 6 (C&I)	249
12	PART-B BOOK 4 OF 6 (Vol. 1 of 2 _CIVIL)	138
13	PART-B BOOK 4 OF 6 (Vol. 2 of 2 _CIVIL)	219
14	PART-B BOOK 5 of 6 (Township works)	378
15	PART-B BOOK 6 OF 6 (QA)	380
16	PART-C	117
17	PART-D	59
18	PART-E (Vol. 1 of 4)	30
19	PART-E (Vol. 2 of 4)	45
20	PART-E (Vol. 3 of 4)	34
21	PART-E (Vol. 4 of 4)	23
22	PART-F	244
23	PART-G (BOOK 1 OF 2)	733
24	PART-G (BOOK 2 OF 2)	529
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Sl No.	Amendment Name	Pages
1	Amdt No. 3 to Tech Spec-Part 1 of 2	84
2	Amdt No. 3 to Tech Spec-Part 2 of 2	17
3	Amdt.1-Sec-II	1
4	Amdt.1-Sec-III	1
5	Amdt.1-Sec-IV	8
6	Amdt.1-Sec-V	1
7	Amdt.1-Sec-VII	25
8	Amdt.2 to ITB_Section-II	1
9	Amdt.2-Sec-III	1
10	Amdt.2-Sec-IV	1
11	Amdt.2-Sec-V	2
12	Amdt.2-Sec-VII	1
13A	Amdt.3 to BDS_ Sec-III	205

13B	Errata No. 1 to Amdt.3-Sec-III	15
14	Amdt.3-Sec-V	1
15	Amdt.3-Sec-VII	24
16	Amdt.4 to SCC_ Sec-V	15
17	Amdt.4-Sec-III	9
18	Amdt.4-Sec-VII	33
19	Amdt.5-Sec-V	11
20	Amdt.5-Sec-VII	699
21	Amdt.6-Sec-V	1
22A	Amdt.6-Sec-VII	14
22B	Revised attachment 8	13
23	Amdt.7 to F&P_ Sec-VII	26
24	Amdt.8-Sec-VII	29
25	Amdt.9-Sec-VII	18
26A	Amend No. 4 to Tech Spec	196
26B	Tender Drawing_ Part1 to Part 6	48
26C	Annexure to Tech. Amdment No. 4 Part-1	45
26D	Annexure to Tech. Amdment No. 4 Part-2	18
26E	Annexure to Tech. Amdment No. 4 Part-3	74
26F	Annexure to Tech. Amdment No. 4 Part-4	93
26G	Annexure-I to Sl.no. 119 of AMDT-01	1
26H	Errata No. - 2 to Amendment No. 4	2
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3	Clarifications 3	9
4	Clarifications 4	13
5	Clarifications 5	1
6	Clarifications 6	1
7	Clarifications 7	1
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