



**SPECIFIC TECHNICAL REQUIREMENT
FOR CIVIL, STRUCTURAL &
ARCHITECTURAL WORKS FOR FLUE
GAS DESULPHURISATION (FGD) SYSTEM
PACKAGE FOR 3x660 MW NPGCPL
NABINAGAR STPP FGD.**

SPECIFICATION NO. PE-TS-457-600-001

VOLUME - IIB

SECTION - C

REV.NO. 0 DATE 19/12/2019

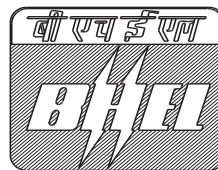
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**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE FOR NPGCPL
NABINAGAR STPP (3x660 MW)**

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**SPECIFIC TECHNICAL REQUIREMENTS FOR CIVIL,
STRUCTURAL & ARCHITECTURAL WORKS**



Bharat Heavy Electricals Limited

**Project Engineering Management
Power Sector, BHEL**



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PART-I

GENERAL CIVIL REQUIREMENT



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1. GENERAL

Two Volumes-Section C & Section D of this specification cover site survey, soil investigation, site development works, design and construction of Civil, Structural and Architectural works. The scope of works covers complete Civil, Structural and Architectural Works including supply of all materials, labour, tools and plants as required for successful execution of the packages. This Part-I of Section-C Lists Codes and Standards to be adopted and the principal structures of the plant, and briefly describes the basic concept, requirements and features pertinent to each. **If there is any ambiguity and/or contradiction between Section C and Section D, the provisions / requirements laid in Section C shall prevail. In case of ambiguity between BOQ and Part C former shall prevail.**

(Contractor shall read the parts of the specification relevant to the contract and shall ignore the other parts of the specification. Relevant clauses of this section as applicable for respective package to be followed.)

2. CODES AND STANDARDS

Following is a general listing of Codes and Standards to be used in the design of the Plant. Specific applicable codes and standards will be identified in System Design Descriptions/ Technical Specifications as appropriate. The latest editions/ revision of following codes and standards along with addendums/ amendments, if any, shall be followed:

2.1. Earthwork

- a) IS-1498: Classification and identification of soils for General Engineering purposes.
- b) IS-3764: Safety Code for excavation work.
- c) IS-7293: Safety Code for working with construction machinery.
- d) IS-4701: Code of practice for earth work on canals.
- e) IS-9759: Guide lines for dewatering during construction.
- f) IS-10379: Code of practice for field control of moisture and compaction of soils for embankment and sub-grade.

2.2. Concrete

- a) IS-269: Ordinary and low heat Portland cement.
- b) IS-383: Coarse and fine aggregate from natural sources for concrete.
- c) IS-432: Mild Steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
- (Part I & II)
- d) IS-455: Portland Slag Cement.
- e) IS-456: Code of Practice for Plain and reinforced concrete.
- f) IS-457: Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
- g) IS-460: Test Sieves (all parts).
- h) IS-516: Methods of test for strength of concrete.
- i) IS-1199: Methods of sampling and analysis of concrete.
- j) IS-1566: Hard drawn steel wire fabric for concrete Reinforcement.
- k) IS-1786: High strength deformed steel bars and wires for concrete Reinforcement.
- l) IS-1791: General requirement for batch type concrete mixers.
- m) IS-1834: Hot applied sealing compounds for joints in concrete.
- n) IS-1838: Preformed fillers for expansion joints in concrete pavement and structures.



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- o) IS-2386: Methods of test for aggregates for concrete (all parts).
(Part I-VIII)
- p) IS-2438: Specification for roller pan mixers.
- q) IS-2502: Code of practice for bending and fixing of bars for concrete Reinforcement.
- r) IS-2505: Concrete vibrators - immersion type.
- s) IS-2506: General requirements for screed board concrete vibrators.
- t) IS-2722: Specification for Portable Swing weigh batchers for concrete (single and double bucket type).
- u) IS-2750: Steel scaffoldings.
- v) IS-2751: Recommended practice for welding of mild steel plain and deformed bars for reinforced construction.
- w) IS-3150: Hexagonal wire netting for general purposes.
- x) IS-3366: Specification for pan vibrators.
- y) IS-3370: Code of practice for concrete structures for storage of liquids (all parts).
(Part I-IV)
- z) IS-3414: Code of practice for design and installation of joints in buildings.
- aa) IS-3558: Code of practice for use of immersion vibrators for consolidating concrete.
- bb) IS-4014: Code of practice for steel tubular scaffolding.
(Part I & II)
- cc) IS-4656: Form vibrators for concrete.
- dd) IS-4925: Concrete batching and mixing plant.
- ee) IS-4948: Welded steel wire fabrics for general use.
- ff) IS-4990: Plywood for concrete shuttering work.
- gg) IS-5256: Code of practice for sealing expansion joints in concrete lining on canals.
- hh) IS-6452: High Alumina Cement for Structural use.
- ii) IS-6461: Glossary of terms relating to cement concrete.
- jj) IS-6494: Code of practice for water proofing of underground reservoir and swimming pools.
- kk) IS-6509: Code of practice for installation of joints in concrete pavements.
- ll) IS-7320: Concrete slump test apparatus.
- mm) IS-7861: Code of practice for extreme weather concreting.
(Part I & II)
- nn) IS-8041: Rapid Hardening Portland Cement.
- oo) IS-8112: High strength ordinary Portland Cement.
- pp) IS-9012: Recommended practice for shotcreting.
- qq) IS-9103: Admixtures for concrete.
- rr) IS-9417: Recommendations for welding cold worked bars for reinforced concrete construction.
- ss) IS-10262: Recommended guidelines for concrete mix design.
- tt) IS-458: Specification for precast concrete pipes.
- uu) IS-3935: Code of practice for composite construction.
- vv) IS-4995: Criteria for design of reinforced concrete bins for storage of granular (all parts) and powdery materials.
- ww) IS-5525: Recommendation for detailing of reinforced concrete works.
- xx) IS-11384: Code of practice for composite construction in structural steel and concrete.
- yy) IS-11682: Criteria for design of RCC staging for overhead water tanks.
- zz) IS-12118: Two parts polysulphide based sealants.
- aaa) IS-12200: Code of practice for provision of water stops at transverse construction joints in masonry and concrete dams.
- bbb) IS-13311: Non-destructive testing of concrete - methods of test.
Part I - Ultrasonic pulse velocity.
Part II - Rebound hammer.
- ccc) IS-13920: Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.



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- ddd) SP-16: Design codes for reinforced concrete to IS:456-1978.
 eee) SP-23: Hand book of concrete mixes.
 fff) SP-24: Explanatory handbook on Indian standards code for plain and reinforced concrete. (IS: 456)
 ggg) SP-34: Hand book on concrete reinforcement and detailing.
 hhh) ACI-318: American Concrete Institute code for structural concrete.
 iii) IS-280: Mild steel wire for general engineering purpose.
 jjj) IS-10297: Code of practice for design and construction of floors and roofs using precast reinforced/prestressed concrete ribbed or cored slab units.
 kkk) IS-10505: Code of practice for construction of floors and roofs using pre-cast reinforced concrete waffle units.
 ll) IS-15658: Pre-cast concrete block for paving.

2.3. Foundations

- a) IS-1080: Code of practice for Design and Construction of shallow foundations on soils (other than raft, ring and shell)
 b) IS-1904: Code of practice for Design and Construction of foundations in soils: General Requirements
 c) IS-2314: Steel sheet piling sections.
 d) IS-2911: Code of practice for Design and Construction of Pile foundations (all parts).
 e) IS-2950: Code of practice for design and construction of raft foundations.
 f) IS-2974: Code of practice for design and construction of machine foundations.
 g) IS-4091: Code of practice for Design and Construction of foundations for transmission line towers and poles
 h) IS-6403: Code of practice for determination of Bearing capacity of Shallow foundations.
 i) IS-8009: Code of practice for calculation of settlement of foundations: (all parts)
 j) IS-9556: Code of practice for Design and Construction of diaphragm walls.
 k) IS-11089: Code of practice for Design and Construction of ring foundation.
 l) IS-12070: Code of practice for design and construction of shallow foundations on rocks.
 m) IS-13301: Guidelines for vibration isolation for machine foundation.
 n) ISO 10816: Criteria for assessing mechanical vibrations of machines.
 o) ISO 1940: Criteria for assessing the st of balance of rotating rigid bodies.
 p) DIN: EN13906-1: Helical compression spring made of round wire and rod: calculation and design of compression.
 q) DIN: 2096 Helical compression spring out of round wire and rod: Quality requirements for hot formed compression spring.
 r) DIN: 4024 Flexible supporting structures for machine with rotating machines.

2.4. Loading

- a) IS-875: Code of practice for Structural safety of buildings - loading standards.
 b) IS-1911: Schedule of unit weights of building materials.
 c) IRC-6: Standard specifications & Code of practice for road bridges.

2.5.Masonry

- a) IS-712: Building limes.
 b) IS-1077: Common Burnt Clay Building Bricks.
 c) IS-1127: Recommendations for dimensions and workmanship of natural building stones for masonry work.
 d) IS-1528: Methods of sampling and physical tests for refractory materials.



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- e) IS-1597: Code of practice for construction of stone masonry (all parts).
- f) IS-2212: Code of practice for brickwork.
- g) IS-2116: Sand for masonry mortars
- h) IS-2185: Concrete masonry units. (all parts - Hollow and Solid concrete blocks).
- i) IS-2250: Code of practice for preparation and use of masonry mortars.
- j) IS-2572: Code of practice for construction of hollow concrete block masonry.
- k) IS-2691: Burnt clay facing bricks.
- l) IS-3414: Code of practice for design and installation of joints in buildings.
- m) IS-3495: Methods of tests of burnt clay building bricks.
- n) IS-4441: Code of practice for use of Silicate type chemical resistant mortars.
- o) IS-4860: Acid Resistant Bricks.
- p) IS-1905: Code of practice for structural use of unreinforced masonry.
- q) IS-10440: Code of practice for construction of reinforced brick and reinforced brick concrete floors and roofs.
- r) SP-20: Hand book on masonry design and construction.
- s) IS-1489: Portland-pozzolana cement.
- t) IS-1542: Sand for Plaster.
- u) IS-12269: 53 grade ordinary Portland cement.
- v) IS-12894: Specification for fly ash lime bricks.
- w) IS-13757: Burnt clay fly ash building bricks.

2.6.Doors, Windows and Ventilators

- a) IS-399: Classification of commercial timbers and their zonal distribution.
- b) IS-883: Code of practice for design of structural timber in building.
- c) IS-1003: Timber panelled and glazed shutters (all parts).
- d) IS-1038: Steel doors, windows and ventilators.
- e) IS-1081: Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
- f) IS-1361: Steel windows for industrial buildings.
- g) IS-2835: Transparent sheet glass for glazing and framing purposes.
- h) IS-1948: Aluminium doors windows and ventilators.
- i) IS-1949: Aluminium windows for industrial building.
- j) IS-2191: Wooden flush door shutters (Cellular and hollow core type).
- k) IS-2202: Wooden flush door shutters (solid core type).
- l) IS-3103: Code of practice for Industrial ventilation.
- m) IS-3548: Code of practice for glazing in buildings.
- n) IS-3614: Fire check doors.
- o) IS-4021: Timber door, windows and ventilator frames.
- p) IS-4351: Steel door frames.
- q) IS-6248: Metal rolling shutters and rolling grills.
- r) IS-208: Door Handles.
- s) IS-281: Mild steel sliding door bolts for use with padlocks.
- t) IS-362: Parliament Hinges.
- u) IS-419: Putty, for use on window frames.
- v) IS-451: Technical supply conditions for wood screws.
- w) IS-733: Wrought aluminium and aluminium alloy bars, rods and sections for general engineering purposes.
- x) IS-1285: Wrought aluminium and aluminium alloy extruded round tube & hollow section (for general engineering purposes).
- y) IS-1341: Steel butt hinges.
- z) IS-1823: Floor door stoppers.
- aa) IS-1868: Anodic coatings on Aluminium and its alloys.



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- bb) IS-2209: Mortice locks (vertical type)
- cc) IS-2553: Safety glass.
- dd) IS-3564: Door closers (Hydraulically regulated).
- ee) IS-5187: Flush bolts.
- ff) IS-5437: Figured, rolled and wired glass.
- gg) IS-6315: Specification for floor springs (Hydraulically regulated) for heavy doors.
- hh) IS-7196: Hold fast.
- ii) IS-7452: Hot rolled steel sections for doors, windows and ventilators.
- jj) IS-10019: Mild steel stays and fasteners.
- kk) IS-10451: Steel sliding shutters (top hung type)
- ll) IS-12823: Prelaminated particle boards.

2.7.Roof and Flooring

- a) IS-2204: Code of practice for construction of reinforced concrete shell roof.
- b) IS-3201: Criteria for the design and construction of precast concrete trusses.
- c) IS-2210: Criteria for Design of R.C. shell structures and folded plates.
- d) IS-809: Rubber flooring materials for general purposes.
- e) IS-1195: Bitumen mastic for flooring.
- f) IS-1196: Code of practice for laying bitumen mastic flooring.
- g) IS-1198: Code of practice for laying, fixing and maintenance of linoleum floors.
- h) IS-1237: Cement concrete flooring tiles.
- i) IS-1443: Code of practice for laying and finishing of cement concrete flooring tiles.
- j) IS-2114: Code of practice for laying in situ terrazzo floor finish.
- k) IS-2571: Code of practice for laying in situ cement concrete flooring.
- l) IS-5491: Code of practice for laying in situ granolithic concrete floor topping.
- m) IS-5766: Code of practice for laying burnt clay brick flooring.
- n) IS-1197: Code of practice for laying of rubber floors.
- o) IS-2441: Code of practice for fixing ceiling coverings.

2.8.Waterproofing

- a) IS-1322: Bitumen felts for waterproofing and damp proofing.
- b) IS-1346: Code of practice for waterproofing of roofs with bitumen felts.
- c) IS-1609: Code of practice for laying damp proof treatment using bituminous felts.
- d) IS-3036: Code of practice for laying lime concrete for a waterproofed roof finish.
- e) IS-3037: Bitumen mastic for use in waterproofing of roofs.
- f) IS-3067: Code of practice for general design, details and preparatory work for damp proofing and water proofing of buildings.
- g) IS-3384: Bitumen primer for use in water proofing and damp proofing.
- h) IS-4365: Code of practice for application of bitumen mastic for waterproofing of roofs.
- i) IS-5318: Code of practice for laying of flexible PVC sheet and tile flooring.
- j) IS-8042: White Portland cement.
- k) IS-13755: Dust pressed ceramic tiles with water absorption of 3%, E 6% (Group B11a).
- l) IS-13801: Chequered cement concrete tiles.

2.9.Soil Engineering

- a) IS-1498: Classification and identification of soils for general engineering purposes.
- b) IS-1892: Code of practice for sub-surface investigation for foundations.
- c) IS-2131: Method for standard penetration test for soils.
- d) IS-2720: Methods of test for soils (all parts).



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2.10. Water Supply, Drainage and Sewerage

- a) IS-404: Lead pipes
- b) IS-458: Concrete pipes
- c) IS-651: Salt glazed stoneware pipes and fittings.
- d) IS-771: Glazed fire-clay sanitary appliances (all parts).
- e) IS-774: Flushing cisterns for water closets and urinals other than plastic cisterns.
- f) IS-783: Code of practice for laying of concrete pipes.
- g) IS-1172: Code of basic requirements for water supply, drainage and sanitation.
- h) IS-1626: Asbestos cement building pipes, gutters and fittings (all parts).
- i) IS-1742: Code of practice for building drainage.
- j) IS-2064: Code of practice for selection, installation and maintenance of sanitary appliances.
- k) IS-2065: Code of practice for water supply in buildings.
- l) IS-2470: Code of practice for installation of septic tanks (all parts).
- m) IS-3114: Code of practice for laying of Cast Iron pipes.
- n) IS-4127: Code of practice for laying of glazed stoneware pipes.
- o) IS-12251: Code of practice for Drainage of Building Basement.
- p) IS-1200: Method of measurement: Laying of water and [Part- XVI] sewer lines including appurtenant items.
- q) IS-1536: Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
- r) IS-1537: Vertically cast iron pressure pipe for water, gas and sewage.
- s) IS-3486: Cast iron spigot and socket drain pipes.
- t) IS-5329: Code of practice for sanitary pipe work above ground for buildings.
- u) IS-3076: Low density polyethylene pipes for potable water supplies.
- v) IS-1538: Cast iron fittings for pressure pipes for water, gas and sewage.
- w) IS-1230: Cast iron rainwater pipes and fittings.
- x) IS-1729: Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
- y) IS-784: Prestressed concrete pipes.
- z) IS-1726: Cast iron manhole covers and frames.
- aa) IS-5961: Cast iron grating for drainage purposes.
- bb) IS-5219: "P" and "S" traps.
- (Part-I)
- cc) IS-772: General requirements for enamelled cast iron sanitary appliances.
- dd) IS-775: Cast iron brackets and supports for wash basins and sinks.
- ee) IS-777: Glazed earthenware wall tiles.
- ff) IS-2548: Plastic water closet seats and covers (all parts).
- gg) IS-2527: Code of practice for fixing rainwater gutters and downpipes for roof drainage.
- hh) IS-554: Pipe threads where pressure tight joints are made on the threads – dimensions, tolerances and designation.
- ii) IS-778: Copper alloy gate, globe and check valves for water works purposes.
- jj) IS-781: Cast copper alloy screw down bib taps & stop valves for water services.
- kk) IS-782: Caulking lead.
- ll) IS-1703: Copper alloy float valve for water supply fitting.
- mm) IS-2326: Automatic flushing cisterns for urinals.
- nn) IS-2556: Vitreous sanitary appliances (vitreous china).
- oo) IS-3311: Waste plug and its accessories for sinks and wash basins.
- pp) IS-3438: Silvered glass mirrors for general purposes.
- qq) IS-3589: Steel pipe for water and sewage (168.3 to 2540mm outside diameter)
- rr) IS-3989: Centrifugally cast (Spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
- ss) IS-4111: Code of practice for ancillary structure in sewerage system.
- (Part I to V)



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- tt) IS-4733: Methods of sampling and testing sewage effluents.
 uu) IS-4764: Tolerance limits for sewage effluents discharged into inland surface waters.
 vv) IS-1068: Electroplated coating of nickel plus chromium and copper plus nickel plus chromium.
 ww) IS-5382: Rubber sealing rings for gas mains, water mains and sewer
 xx) IS-5822: Code of practice for laying of electrically welded steel pipes for water supply.
 yy) IS-7740: Code of practice for construction and maintenance of road gullies.
 zz) IS-8931: Copper alloy fancy single taps combination tap assembly and stop valves for water services.
 aaa) IS-9762: Polyethylene floats for float valves.
 bbb) IS-10592: Industrial emergency showers, eye and face fountains and combination units.
 ccc) IS-12592: Specification for precast concrete manhole covers and frames.
 ddd) IS-12701: Rotational moulded polyethylene water storage tanks.
 eee) IS-13983: Stainless steel sinks for domestic purposes.
 fff) SP-35: Hand book on water supply and drainage with special emphasis on plumbing.

2.11. Paving and Road works

- a) IS-73: Paving bitumen
 b) IS-702: Industrial Bitumen
 c) IS-1201: Method of testing tar and bituminous materials. thru' 1220
 d) : Practice followed by Indian Road Congress (all parts).

2.12. Earthquake Resistant Design

- a) IS-1893: Criteria for earthquake resistant design of structures.
 b) IS-4326: Code of practice for earthquake resistant design and construction of buildings.

2.13. Chimney

- a) IS-4998: Criteria for Design of R.C. Chimneys (all parts).
 b) IS-6533: Code of practice for design and construction of steel chimneys
 c) ACI-307: Specification for the design and construction of reinforced concrete chimneys
 d) BS-4076: Specification for steel chimneys
 e) CICIND: Model Code for concrete chimneys / Model code for steel chimneys

2.14. Cooling Tower

- a) BS-4485: Structural design of cooling towers.
 (Part 4)

2.15. Structural Steelwork

- a) IS-800: Code of practice for general construction in steel.
 b) IS-802: Code of practice for use of structural steel in Overhead Transmission Line (All Parts).
 c) IS-806: Code of practice for use of steel tubes in general building construction.
 d) IS-808: Rolled steel beams, channels and angle sections.
 e) IS-813: Scheme of symbols for welding.
 f) IS-814: Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
 g) IS-816: Code of practice for use of metal arc welding for general construction in mild steel.



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- h) IS-817: Code of practice for training and testing of metal arc welders.
- i) IS-818: Code of practice for safety and health requirements in electric and gas welding and cutting operation.
- j) IS-819: Code of practice for Resistance spot welding for light assemblies in Mild Steel.
- k) IS-919: Recommendations for limits and fits for engineering.
- l) IS-1024: Code of practice for use of welding in Bridges and Structures subjected to Dynamic loading.
- m) IS-1161: Steel tubes for structural purposes.
- n) IS-1182: Recommended practice for Radiographic Examination of Fusion Welded Butt joints in steel plates.
- o) IS-1200: Method of measurement of steelwork and ironwork.
(Part-VIII)
- p) IS-1239: Mild steel tubes, tubulars and other wrought steel fittings (all parts).
- q) IS-1363: Black hexagonal bolts, nuts and locknuts (Dia. 6 to 39 mm) and black hexagon screws (Dia.6 to 24 mm). [all parts]
- r) IS-1364: Precision and semi-precision hexagon bolts, screws, nuts and locknuts (Dia. range 6 to 39 mm). [all parts]
- s) IS-1365: Slotted counter sunk head screws (Dia. range 1.6 to 20 mm).
- t) IS-1367: Technical supply conditions for threaded steel fasteners. (Part 1 to 18)
- u) IS-1443: Code of practice for laying and finishing of cement concrete flooring tiles.
- v) IS-1608: Method for tensile testing of steel products.
- w) IS-1730: Dimensions for steel plate, sheet and strip for structural and general engineering purpose.
- x) IS-1731: Dimensions for steel flats for structural and general engineering purposes.
- y) IS-1852: Rolling and cutting tolerances for hot rolled steel products.
- z) IS-1977: Structural steel (Ordinary quality)
- aa) IS-2016: Plain Washers
- bb) IS-2062: Steel for General structural purposes.
- cc) IS-2074: Ready mixed paint, air drying, red oxide zinc-chrome, priming.
- dd) IS-2633: Methods of testing uniformity of coating of zinc coated articles.
- ee) IS-3613: Acceptance tests for wire-flux combinations for submerged-arc welding of structural steels.
- ff) IS-3664: Code of practice for Ultrasonic Pulse echo testing by contact and immersions methods.
- gg) IS-3757: High strength structural bolts.
- hh) IS-4000: High strength bolts in steel structures.
- ii) IS-4759: Hot dip zinc coatings on structural steel and other allied products.
- jj) IS-5334: Code of practice for Magnetic Particle Flaw detection of welds.
- kk) IS-7215: Tolerances for fabrication of steel structures.
- ll) IS-7280: Base-wire electrodes for sub-merged arc welding of structural steels.
- mm) IS-7318: Approval test for welders when welding procedure approval is not required.
(Part-I)
- nn) IS-8500: Structural steel - micro alloyed (medium and high strength qualities).
- oo) IS-9595: Recommendation for metal arc welding of carbon and carbon manganese steels.
- pp) AWS D.1.1: Structural Welding Code.
- qq) IS-8640: Recommendations for dimensional parameters for industrial building.
- rr) IS-9178: Criteria for design of steel bins for storage of bulk material (all parts).
- ss) IS-12843: Tolerances for erection of steel structures.
- tt) IS-1181: Qualifying tests for Metal Arc welders (engaged in welding structures other than pipes).
- uu) IS-2595: Code of practice for Radiographic testing
- vv) IS-2629: Hot dip galvanising of iron and steel
- ww) IS-3502: Steel chequered plate.



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- xx) IS-3658: Code of practice for liquid penetrant flaw detection.
 yy) IS-4353: Sub merged arc welding of mild steel and low alloy steel Recommendation.
 zz) IS-5369: General requirements for plain washers and lock washer.
 aaa) IS-6623: High strength structural nuts.
 bbb) IS-6649: Hardened and tempered washers for high strength structural bolts & nuts.
 ccc) IS-6911: Stainless steel plate, sheet and strip.
 ddd) IS-7205: Safety code for erection of structural steel.
 eee) IS-7307: Approved test for welding procedures
 (Part I) Fusion welding of Steel
 fff) IS-7310: Approval test for welders working to approval welding procedure.
 (Part I) Fusion welding of Steel
 ggg) SP-6: IS Handbook for structural engineers.

2.16. Painting

- a) IS-348: Specification for French Polish.
 b) IS-427: Specification for Distemper, dry colour as required.
 c) IS-428: Specification for Distemper, oil emulsion, colour as required.
 d) IS-1477: Code of practice for painting of ferrous metal in buildings.
 (Part I & II)
 e) IS-2338: Code of practice for finishing of wood and wood based materials.
 (Part I & II)
 f) IS-2339: Specification for Aluminium Paints for general purposes in dual containers.
 g) IS-2395: Code of practice for painting concrete, masonry and plaster surface.
 h) IS-2932: Specification for enamel, synthetic, exterior - a) undercoating, b) finishing.
 i) IS-2933: Specification for enamel, exterior - a) undercoating, b) finishing.
 j) IS-5410: Specification for cement paint.
 k) IS-162: Ready mixed paint, brushing fire resisting, silicate type for use on wood, colour as required.
 l) IS-1650: Specification for colours for building and decorative materials.
 m) IS-2395: Code of practice for painting concrete, masonry and plaster surfaces.
 (Part I) Operations and Workmanship.
 (Part II) Schedule.
 n) IS-2524: Code of practice for painting of nonferrous metals in buildings.
 (Part I) Pre-treatment.
 (Part II) Painting.
 o) IS-15489: Plastic emulsion paint.
 p) IS-6278: Code of practice for white washing and Colour washing.
 q) IS-10403: Glossary of term related to building finish.
 r) IS-12027: Silicone based water repellent.
 s) IS-13238: Epoxy based zinc phosphate primer (2 pack).
 t) IS-13239: Epoxy surface (2 pack).
 u) IS-13467: Chlorinated rubber for paints
 v) IS-14209: Epoxy enamel, two component glossy.
 w) BS-5493: Code of practice for protective coating of iron and steel structures against corrosion.

2.17. Sheetting

- a) IS-277: Galvanised steel sheets (Plan & corrugated).
 b) IS-513: Cold-rolled low carbon steel sheets & strips.
 c) IS-730: Hook bolts for corrugated sheet roofing.
 d) IS-801: Code of practice for use of cold formed light gauge steel structural members in general building construction.



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- e) IS-7178: Technical supply condition for tapping screw.
- f) IS-8183: Bonded mineral wool.
- g) IS-8869: Washers for corrugated sheet roofing.
- h) IS-12093: Code of practice for laying and fixing of sloped roof covering using plain and corrugated galvanized steel sheets.
- i) IS-12436: Preformed rigid Polyurethane (PUR) and Polyisocyanurate (PIR) foams for thermal insulation.
- j) IS-12866: Plastic translucent sheets made from thermosetting polyester resin (glass fiber reinforced).
- k) IS-14246: Continuously pre-painted galvanized steel sheets and coils.
- l) BS-5950: Code of practice for design of light gauge profiled steel sheeting (Part VI)

2.18. Plastering

- a) IS-1661: Code of practice for application of cement and cement lime plaster finishes.
- b) IS-2402: Code of practice for external rendered finishes.
- c) IS-2547: Gypsum building plaster.

2.19. Acid / Alkali Resistant Tiling

- a) IS-158: Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali & heat resisting.
- b) IS-412: Expanded metal steel sheets for general purpose.
- c) IS-4443: Code of practice for use of resin type chemical resistant mortars.
- d) IS-4456: Method of Test for chemical resistant tiles.
(Part I & II)
- e) IS-4457: Ceramic unglazed vitreous acid resisting tiles.
- f) IS-4832: Specification for chemical resistant mortars.
(Part I) Silicon Type
(Part II) Resin Type
(Part III) Sulphur Type
- g) IS-9510: Bitumastic acid resisting grade.

2.20. Safety

- a) IS-1641: Code of practice for fire safety of buildings - General principles of fire grading and classification.
- b) IS-1642: Code of practice for fire safety of buildings - Details of construction.
- c) IS-3696: Safety code for scaffolds and ladders.
(Part I & II)
- d) IS-4081: Safety code for blasting and related drilling operations.
- e) IS-4130: Demolition of buildings - code of safety.
- f) IS-5121: Safety code for piling and other deep foundations.
- g) IS-5916: Safety code for construction involving use of hot bituminous materials.
- h) IS-7205: Safety code for erection of structural steel work.
- i) IS-7969: Safety code for handling and storage of building materials.



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2.21. Architectural Design of Buildings

- a) SP-7: National Building Code of India.
- b) SP-41: Hand book on functional requirements of buildings (other than industrial buildings).
- c) ECBC: Energy Conservation Building Code
- d) GRIHA: Green Rating for Integrated Habitat Assessment.

2.22. Other

- a) Indian Road Congress (IRC) Bridge Codes
- b) Indian Railway Standard Bridge Rules

3. GENERAL

All the quality standards, tolerances, welding standards and other technical requirements shall be strictly adhered to. The Bidder shall fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, soil conditions, local conditions and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications. In case of any conflict between stipulations in various portions of the specification, most stringent stipulation would be applicable for implementation by the Bidder without any extra cost to the Employer.

4. LAYOUT

Before starting the work, the Contractor shall carry out the setting out of foundation and structures and provide levels, with reference to general existing grid and bench mark. **If the Contractor uses the grid, bench mark and reference pillar made by other Contractors, he shall coordinate with the Contractor and shall satisfy himself of the accuracy of the reference marks.** If he is required to set out the foundation afresh, he shall do so independently with reference to the one existing grid and bench

mark which has been followed by other agency at the instruction of the Engineer. In case any discrepancy is found, it shall be immediately brought to the notice of the Engineer for any rectification/modification necessary. No complaint shall be entertained at a later stage. The Contractor shall accurately set out the position for holding down bolts and inserts.

If required, in the opinion of the Engineer, he shall construct and maintain pillars for grid, references and bench marks and maintain them till the completion of the construction. He shall also help the Engineer with instruments, materials and labours for checking the detailed layouts and levels. The Contractor shall be solely responsible for the correctness of the layout and levels, and Engineer's approval shall not be deemed to imply any warranty in carrying out the works correctly. The Tenderer's shall take into account the cost of these in quoting their price.

5. WORKMANSHIP

Workmanship shall be of the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. Welding shall be done by experienced and certified welders in proper sequence using necessary jigs and fixtures. Fabrication shall be done in shops having proper equipment for accurate edge and shaping and dimensioning of anchor bolt assembly, inserts and other misc. items. In addition to the requirement specified above, if the bye laws of the local Govt., Municipal or other authorities require the employment of licensed or registered workmen for various trades, the Contractor shall arrange to have the work done by such registered or



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licensed personnel. In case of manufactured materials, the Contractor shall have, with no additional cost to the Owner, the services of the supervisors of the manufacturers to ensure that the work is being done according to the manufacturer's specifications.

6. TEMPORARY WORK

All scaffoldings, staging, temporary bracing and other necessary temporary work required for proper execution of the Contract shall be provided by the Contractor at his own cost and inclusive of all materials, labour, supervision and other facilities.

The layout and details of such Temporary work shall have the prior approval of the Engineer, but the Contractor shall be responsible for proper strength and safety of the same. All Temporary work shall be so constructed as not to interfere with any permanent work or with the work by other agencies. If it is necessary to remove any of the temporary work at any time to facilitate execution of the work or with the work of other agencies, such removal and re erection, if required, shall be carried out by the Contractor at the direction of the Engineer without any delay and any extra cost on this account shall be borne by the Contractor.

7. INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE

Modification in layout of foundation/structure during detail engineering stage may be necessary to avoid fouling with those under other's scope. Necessary changes on this account will be made without any extra cost to Owner.

8. SEQUENCE OF WORK AND PROGRESS REPORT

The sequence in which the works are to be carried out shall be as approved by the Engineer in accordance with the construction method accepted by the Engineer and to be followed by the Contractor. A programme of work is to be submitted for the Engineer's review and approval and this has to be periodically updated and modified as per actual progress to enable timely completion.

The Contractor shall regularly submit to the Engineer progress reports for periods of working as specified by the Engineer showing up to date progress on all important items of work.

9. CONSTRUCTION METHODOLOGY

Construction and erection activities shall be fully mechanized from the start of the work. All excavation and backfilling work shall be done using excavators, loaders, dumpers, dozers, porcelains, excavator mounted rock breakers, rollers, sprinklers, water tankers, etc. Manual excavation can be done only on isolated places with specific approval of engineer.

Dewatering shall be done using the combination of electrical and standby diesel pumps.

For concreting, weigh batching plants, transit mixers, concrete pumps, hoists, etc. shall be used.

All handling of materials shall be with cranes.

Heavy trailers shall be used for transportation.



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Mechanized modular units of scaffolding and shuttering shall be used.

Grouting shall be carried out using hydraulically controlled grouting equipment.

All finishing items shall be installed using appropriate modern mechanical tools. Manual punching etc. shall not be permitted.

Heavy duty hoists for lifting of construction materials shall be deployed.

Compressors for cleaning of foundations and other surfaces shall be used.

Field laboratory shall be provided with all modern equipment for survey, testing of soil, aggregates, concrete, welding, etc.

All persons working at site shall be provided with necessary safety equipment and all safety aspects shall be duly considered for each construction/ erection activity. Moreover, only the persons who are trained in the respective trade shall be employed for executing that particular work.



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PART-II

SPECIFIC TECHNICAL REQUIREMENT

NTPC Limited

(A Government of India Enterprise)



LOT 1A PROJECTS

(PART –A)

SECTION – VI

**TECHNICAL SPECIFICATION
FOR
FLUE GAS DESULPHURISATION (FGD)
SYSTEM PACKAGE**

BIDDING DOCUMENT NO. : CS-0011-109(1A)-2

NTPC Limited

(A Government of India Enterprise)



LOT 1A PROJECTS

(PART –A)

SECTION – VI

**TECHNICAL SPECIFICATION
FOR
FLUE GAS DESULPHURISATION (FGD)
SYSTEM PACKAGE**

BIDDING DOCUMENT NO. : CS-0011-109(1A)-2

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FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

BIDDING DOCUMENT NO. : CS-0011-109(1A)-2

LIST OF LOT 1A PROJECTS

1. PROJECT INFORMATION- KUDGI-I 3X800 MW
2. PROJECT INFORMATION- LARA-I 2X800 MW
3. PROJECT INFORMATION- GADARWARA-I 2X800 MW
4. PROJECT INFORMATION- DARLIPALLI-I 2X800 MW
5. PROJECT INFORMATION- MOUDA-II 2X660 MW
6. PROJECT INFORMATION- SOLAPUR-II 2X660 MW
7. PROJECT INFORMATION- TANDA-II 2X660 MW
8. PROJECT INFORMATION- NABINAGAR-I 3X660 MW
9. PROJECT INFORMATION- MEJA-I 2X660 MW
10. PROJECT INFORMATION- BARH-I 3X660 MW
11. PROJECT INFORMATION- NABINAGAR 4X250 MW



LOT-IA PROJECTS

SECTION - VI

TECHNICAL SPECIFICATION FOR FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

THE TECHNICAL SPECIFICATION, SECTION - VI COMPRISE OF THE FOLLOWING PARTS

PART – A

SUB-SECTION-I	INTENT OF SPECIFICATION
SUB-SECTION-II	PROJECT INFORMATION
SUB-SECTION-II-A1	PROJECT INFORMATION- KUDGI-I 3X800 MW
SUB-SECTION-II-A2	PROJECT INFORMATION- LARA-I 2X800 MW
SUB-SECTION-II-A3	PROJECT INFORMATION- GADARWARA-I 2X800 MW
SUB-SECTION-II-A4	PROJECT INFORMATION- DARLIPALLI-I 2X800 MW
SUB-SECTION-II-A5	PROJECT INFORMATION- MOUDA-II 2X660 MW
SUB-SECTION-II-A6	PROJECT INFORMATION- SOLAPUR-II 2X660 MW
SUB-SECTION-II-A7	PROJECT INFORMATION- TANDA-II 2X660 MW
SUB-SECTION-II-A8	PROJECT INFORMATION- NABINAGAR-I 3X660 MW
SUB-SECTION-II-A9	PROJECT INFORMATION- MEJA-I 2X660 MW
SUB-SECTION-II-A10	PROJECT INFORMATION- BARH-I 3X660 MW
SUB-SECTION-II-A11	PROJECT INFORMATION- NABINAGAR 4X250 MW
SUB-SECTION-III	SCOPE OF SUPPLY & SERVICES
SUB-SECTION-III-A	MECHANICAL EQUIPMENTS & SYSTEMS
SUB-SECTION-III-A1	FLUE GAS DESULPHURISATION SYSTEM
SUB-SECTION-III-A2	AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM
SUB-SECTION-III-A3	FIRE FIGHTING SYSTEM
SUB-SECTION-III-A4	EQUIPMENT COOLING WATER SYSTEM
SUB-SECTION-III- A5	LIME STONE & GYPSUM HANDLING SYSTEM
SUB-SECTION-III- A6	ZERO LIQUID DISCHARGE SYSTEM

LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

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SUB-SECTION-III-B	ELECTRICAL SYSTEM/EQUIPMENT
SUB-SECTION-III-C	CONTROL AND INSTRUMENTATION SYSTEM
SUB-SECTION-III-D	CIVIL WORKS
SUB-SECTION-IV	TERMINAL POINTS & EXCLUSIONS
SUB-SECTION-V	SALIENT DESIGN DATA & SIZING
SUB-SECTION-VI	FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES
SUB-SECTION-VII	MANDATORY SPARES

PART – B (DETAILED TECHNICAL SPECIFICATION)

SUB-SECTION-I-M (MECHANICAL SYSTEM)

SUB-SECTION-I-M1	FLUE GAS DESULPHURISATION SYSTEM
SUB-SECTION-I-M2	AIR CONDITIONING & VENTILATION SYSTEM
SUB-SECTION-I-M3	COMPRESSED AIR SYSTEM
SUB-SECTION-I-M4	FIRE DETECTION & PROTECTION SYSTEM
SUB-SECTION-I-M5	EQUIPMENT COOLING WATER SYSTEM
SUB-SECTION-I-M6	LIME STONE & GYPSUM HANDLING SYSTEM
SUB-SECTION-I-M7	ZERO LIQUID DISCHARGE SYSTEM
SUB-SECTION-I-M8	PIPING
SUB-SECTION-I-M9	MDL

PART – B (DETAILED TECHNICAL SPECIFICATION)

SUB-SECTION-II-E (ELECTRICAL SYSTEM)

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SUB-SECTION-II-E3	MEDIUM VOLTAGE BUS DUCTS
SUB-SECTION-II-E4	LT POWER CABLES
SUB-SECTION-II-E5	LT CONTROL CABLES
SUB-SECTION-II-E6	CABLING EARTHING & LIGHTNING PROTECTION
SUB-SECTION-II-E7	HT CABLES

**LOT-IA PROJECTS
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**TECHNICAL SPECIFICATION
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SUB-SECTION-II-E8	ELECTRIC ACTUATORS WITH INTEGRAL STARTERS
SUB-SECTION-II-E9	HT SWTIGCHGEAR
SUB-SECTION-II-E10	LT SWTIGCHGEAR & LT BUSDUCT
SUB-SECTION-II-E11	DIESEL GENERATORS
SUB-SECTION-II-E12	OUTDOOR TRANSFORMERS
SUB-SECTION-II-E13	ELEVATOR ELECTRICAL
SUB-SECTION-II-E14	FIRE PROOF CABLE PENETRATION SEALING SYSTEM
SUB-SECTION-II-E15	LIGHTING
SUB-SECTION-II-E16	BATTERY
SUB-SECTION-II-E17	BATTERY CHARGER

PART – B (DETAILED TECHNICAL SPECIFICATION)

SUB-SECTION-III-C (CONTROL & INSTRUMENTATION SYSTEM)

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SUB-SECTION-III-C2	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)
SUB-SECTION-III-C3	PROCESS CONNECTION AND PIPING
SUB-SECTION-III-C4	INSTRUMENTATION CABLES
SUB-SECTION-III-C5	PLC BASED CONTROL SYSTEM
SUB-SECTION-III-C6	TYPE TEST REQUIREMENTS
SUB-SECTION-III-C7	CONTROL VALVES, ACTUATORS & ACCESSORIES

PART – B (DETAILED TECHNICAL SPECIFICATION)

SUB-SECTION-IV-D (CIVIL WORKS)

SUB-SECTION-IV-D	CIVIL WORKS



PART – B (DETAILED TECHNICAL SPECIFICATION)

SUB-SECTION- V-Q (QUALITY ASSURANCE)

(MECHANICAL)

SUB-SECTION-V-QM1	FLUE GAS DESULPHURISATION SYSTEM
SUB-SECTION-V-QM2	LIME & GYPSUM HANDLING
SUB-SECTION-V-QM3	EQUIPMENT COOLING WATER SYSTEM
SUB-SECTION-V-QM4	AIR CONDITIONING & VENTILATION
SUB-SECTION-V-QM5	ZERO LIQUID DISCHARGE SYSTEM
SUB-SECTION-V-QM6	COMPRESSOR AIR SYSTEM

(ELECTRICAL)

SUB-SECTION-V-QE1	MOTORS
SUB-SECTION-V-QE2	MEDIUM VOLTAGE BUS DUCTS
SUB-SECTION-V-QE3	LT POWER CABLES
SUB-SECTION-V-QE4	CONTROL CABLES
SUB-SECTION-V-QE5	CABLING EARTHING & LIGHTNING PROTECTION
SUB-SECTION-V-QE6	HT CABLES
SUB-SECTION-V-QE7	ELECTRIC ACTUATORS WITH INTEGRAL STARTERS
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SUB-SECTION-V-QE9	LT SWTIGCHGEAR
SUB-SECTION-V-QE10	DIESEL GENERATORS
SUB-SECTION-V-QE11	AUXILIARY TRANSFORMERS
SUB-SECTION-V-QE12	ELEVATOR
SUB-SECTION-V-QE13	VFD MODULE
SUB-SECTION-V-QE14	STATION LIGHTING



(CONTROL & INSTRUMENTATION SYSTEM)

SUB-SECTION-V-QC1	MEASURING INSTRUMENTS
	(PRIMARY & SECONDARY
SUB-SECTION-V-QC2	PROCESS CONNECTION & PIPING
SUB-SECTION-V-QC3	INSTRUMENTATION CABLES
SUB-SECTION-V-QC4	CONTROL DESK PLC PANEL SMOKE DETECTOR
	FIRE ALARM & CONTROL SYSTEM
SUB-SECTION-V-QC5	POWER SUPPLY SYSTEM
SUB-SECTION-V-QC6	CONTROL VALVE ACTUATORS AND ACCESSORIES
SUB-SECTION-V-QC7	ELECTRICAL ACTUATOR WITH INTEGRAL STARTERS

(CIVIL WORKS)

SUB-SECTION-V-QD1

SUB-SECTION- VI

(PRE-COMMISSIONING ACTIVITIES, COMMISSIONING OF FACILITIES AND
INITIAL OPERATIONS)

PART - C

GENERAL CONDITIONS OF CONTRACT

PART - D

ERECTION CONDITIONS OF CONTRACTS

PART - E

LIST OF TENDER DRAWINGS

PART - F

ATTACHMENT-12 TO SECTION-VII (TECHNICAL DATA SHEETS)

LOT-IA PROJECTS
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TECHNICAL SPECIFICATION
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PART – A

**LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
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SUB-SECTION-I

INTENT OF SPECIFICATION

**LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-0011-109(1A)-2**

CLAUSE NO.	INTENT OF SPECIFICATION			
1.00.00 1.01.00	INTENT OF SPECIFICATION Scope of the proposal The scope of the proposal for Engineering, Supply, Construction, Erection, Testing & Commissioning works for each project of Flue Gas Desulphurisation (FGD) System Package for Lot 1A Projects shall be on the basis of a single point responsibility, completely covering the following activities and services in respect of all the equipment specified and covered under the specifications and read in conjunction with “Scope of Supply & Services”, Sub-section-III, Part-A, Section – VI of Technical Specification. a) Basic Engineering of the plant including preparation of Plant Definition Manuals for the Project; b) Detailed design of all the equipment and system(s) including civil, structure steel works included in bidder's scope for the Project. c) Providing engineering drawings, equipment sizing & performance data, instruction manuals, as built drawings and other information; d) Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required; e) Complete manufacturing including shop testing/type testing; f) Complete Civil, Structural and Architectural works, including survey, providing construction offices, field laboratory and construction equipments; g) Packing and transportation from the manufacturer's works to the site including customs clearance & port clearance, port charges, if any. h) Receipt, storage, preservation, handling and conservation of equipment at the site; i) Fabrication, pre-assembly, if any, erection, testing, commissioning and completion of facilities including putting into satisfactory operation all the equipment including successful completion of initial operation; j) Reliability tests, performance and guarantee tests after successful completion of facilities; k) Furnishing of spares on FOR site basis; l) Reconciliation with customs authorities, as required.			
LOT-1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-0011-109-(1A)2	SUB-SECTION-I INTENT OF SPECIFICATION	PAGE 1 OF 19	

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1.02.00	m) Satisfactory conclusion of the contract. n) Insurance and other requirements for the complete FGD package in accordance with the provisions of general conditions of contract (Section-IV) of the bidding document. The requirements, conditions, appendices etc. given in Technical Specifications (Section-VI, Parts A, B, C, D, E & F and shall apply to and shall be considered as a part of this volume as completely as if bound here with. The work to be carried out as per the above scope shall be all in accordance with the requirements, conditions, appendices, etc., stated in Section GCC, which shall be considered as a part of the Technical Specification (Section VI) as completely as if bound herewith. The Contractor 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 this specification, irrespective of whether it has been specifically listed herein or not. It is not the intent to specify completely herein, all aspects of design and construction of equipment, nevertheless, the equipment shall conform in all aspects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to the Employer, who will interpret the meaning of the specification, 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 international standards mentioned elsewhere in the specification. Bidders are requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specification. Before, submitting their offer, Bidder is required to visit the Project site for assessing the feasibility & layout for FGD System. The Bidder's offer should not carry any sections like clarifications, interpretations and/or assumptions. In the event of conflict between the Technical Specifications and the Conditions of Contract, the requirements as indicated in the technical specification shall govern, unless confirmed otherwise by the Employer in writing before the award of this contract, based on a written request from the Bidder for such a clarification. However, if the Bidder feels that, in his opinion, certain features brought out in his offer are superior to what has been specified, these may be highlighted separately. The Bidder may also make alternate offers provided, such offers are superior in his opinion, to the requirements of these specifications in which case, adequate technical information, operating feed back, etc., are to be enclosed with the offer, to enable the Employer to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumption etc., shall be clearly brought out for the Employer to make an overall assessment. In any case, the base offer shall necessarily be in line with the specifications. Under no circumstances the specified equipment and services shall be brought out as an alternative offer.			
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	In case, all the above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.		
1.03.00	The following are the equipment's covered in this specification:		
1.03.01	Wet limestone based Flue gas desulphurization (FGD) for the project, capable of reducing to the specified limits the emissions of Sulphur Dioxide in flue gas produced by specified coal being fired in boiler, complete with all accessories and auxiliary equipment's as per specification requirements including Booster Fans for each unit, Absorber for each unit with Slurry re-circulation pumps & Oxidation blowers, common Limestone Grinding & slurry preparation system, common Gypsum dewatering system, Limestone handling and storage system, Gypsum handling and storage system.		
1.03.02	~~One (1) number of elevator for each absorber and One (1) numbers of elevator for Limestone Grinding System building.~~		
1.03.03	Buildings for Slurry re-circulation pumps/Oxidation blowers, Limestone Grinding System, Gypsum dewatering system & FGD control Room.		
1.03.04	~~All motors, HT & LT Switchgears, DC System, Transformers, Electrical Actuators, HT & LT power & control cables, DG set (if applicable), cabling, lighting etc.~~		
1.03.05	~~ZERO LIQUID DISCHARGE (ZLD) SYSTEM for FGD waste water for Barh-I (3X660 MW) & Nabinagar (4x250 MW).~~		
1.03.06	Low Height Wet Chimney(s) for the project.		
1.03.07	~~Associated Control & Instrumentation (C&I) equipments.~~		
1.03.08	Associated Civil, Structural and Architectural works including foundation as specified in Technical Specification.		
1.04.00	Wherever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific items mentioned shall be understood to be descriptive only and not restrictive. Such description indicates the equipment type, function and quality desired. Other manufacturer's products may be considered provided sufficient information so as to enable the Employer to determine that the products proposed are equivalent to those named.		
2.00.00	Additional Requirements (a) Before submitting his 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		
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3.00.00	circumstances which may influence or affect his offer. No consequent extra claims on any misunderstanding or otherwise shall be allowed by the Employer. (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 contractor on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately made good by the contractor at his own cost to the satisfaction of the Employer. The contractor shall also take all necessary safety measures with specific reference to excavation in rock, 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 contractor shall adopt pre-engineered / pre-fabricated constructions made of steel with single / double skin, insulated or uninsulated roof and wall coverings (fabricated out of permanently color coated metal sheets). Alternatively, contractor can adopt readymade 'Porta cabin' or similar construction. Contractor 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, contractor 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 and labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products along with each bill. (e) Contractor shall establish/set up at site suitable repair facilities for construction plant, equipment and machinery (like piling rigs, cranes batching plant, dewatering pumps etc.) In case of piling rigs, cranes, batching plant 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. Contractor shall deploy dedicated qualified, full time mechanical/electrical foreman/supervisors for manning the repair facilities as specified above.		
	APPLICABLE DRAWINGS The drawings listed below and forming part of the specification (Refer Part-E) shall supplement the requirements specified herein. The scope and terminal points of the equipment to be furnished under this steam generator package shall be as identified in these drawings and read in conjunction with text of the specification:		
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	(A) SCHEMES				
	Sl. No	Drawings Title	Drawings No.	Rev. No.	No. of Sheets
	1)	Scheme of Absorber system	0011-109-POM-A-001	A	2
	2)	Scheme of Limestone Milling system	0011-109-POM-A-002	A	1
	3)	Scheme of Gypsum De-watering system	0011-109-POM-A-003	A	1
	4)	P&ID Diagram for ECW System of FGD	0011-109-POM-A-004	A	1
	5)	Process Flow Diagram for FGD Waste water treatment (FGD WWT) for ZLD	0011-109-POM-A-005	A	3
	(B) CONTROL & INSTRUMENTATION				
	Sl. No.	Drawings Title	Drawings No.	No. of Sheets	
	1.	Standard configuration diagram for PLC	0000-151-POI-A-013	1	
	2.	G.A. of Junction Box	0000-999-POI-A-017	1	
	3.	Instrumentation cabling diagram grounding scheme for cabinets/panels/Power Supply	0000-999-POI-A-019A	2	
	4.	Scheme of 24V DC Power supply system	0000-999-POI-A-019B	1	
	5.	Scheme for Uninterruptible Power Supply System	0000-999-POI-A-019C	1	
	6.	Instrumentation/control/power supply cabling diagram	0000-101/102-POI-A-021	3	
7.	Instrument Source Connection details	0000-999-POI-A-035	14		
8.	Typical GA of Local Instrument	0000-999-POI-A-036	1		
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	Sl. No. Drawings Title Drawings No. No. of Sheets Enclosure, purging scheme, DP transmitter 9. Interfacing of actuators 10. Interfacing of field instruments/Electrical interface/PLC Interface (C) ELECTRICAL (1) Electrical single line diagram for FGD Package	0000-999-POI-A-063 0000-999-POI-A-065 : Drg No. 0011-109-POE-J-001/A-E	1 15	
	Note : All the above drawings are indicative of Employer’s requirements to enable the Bidder to make a suitable offer. All variations/alternations 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 subjected to the Employer’s approval. However, the flexibility of operation and maintenance desired by the schemes and layouts shall be binding. Electrical drawings (except Electrical single line diagram) are attached with respective Electrical Chapters in Part b, Section VI.			
4.00.00	QUALIFYING REQUIREMENTS FOR EQUIPMENTS/SYSTEMS			
4.01.00	Provenness criteria for critical equipment, auxiliaries, systems and bought out items: The Bidder / Bidder's sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for critical equipment, auxiliaries, system and bought out items as per criteria stipulated below:			
4.01.01	Booster Fans, Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, Agitators & Vacuum Belt Filters for the Wet Limestone based Flue Gas Desulphurisation (FGD) System offered by the Bidder shall be only from such manufacturer(s) who has previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the respective equipment(s) of the type, application and minimum equipment rating as stipulated below such that the respective equipment(s) should have been in successful operation in at least one (1) plant for a period not less than one(1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder:			
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	<u>Type and Rating for Qualification</u>				
	Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating
	(a)	Booster Fans	Axial type with variable pitch control	Coal fired power plant	80% of the flow & 100% of the head of the offered Booster Fan with Fan Speed 900 rpm (maximum)
	(b)	Slurry Recirculation Pumps	Centrifugal type	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Slurry Recirculation Pump
	(c)	Oxidation Blowers	Centrifugal/ positive displacement type blower	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Oxidation Blower
	(d)	Wet limestone Grinding mills	Horizontal Wet Ball mill	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru 325 mesh
	(e)	Slurry Pumps	Centrifugal type	Wet Limestone based FGD application or ash slurry application in Coal fired power plant	80% of the flow & 100% of the head of the offered Slurry Pump(s)
	(f)	Agitators	Vertical/Horizontal	Wet Limestone based FGD application in Coal fired power plant	Agitator rating not less than that supplied for 500 MW or higher size unit for similar application
	(g)	Vacuum Belt filters	Belt type	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Vacuum Belt filter capacity
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4.01.02 4.01.03 4.01.04 4.01.05	Bidder shall offer and supply only the type of the above equipment(s) for which he himself or the manufacturer proposed by the bidder for the above equipment(s) is qualified. The provenness criteria for equipment (Booster Fans) stipulated at Sl. No. 4.01.01 (a) above shall also be considered acceptable provided the rating parameters (i.e., flow, head and rated rpm) is covered within the operating regime of the respective fan performance curve of the reference plant equipment. In case the Bidder or the proposed sub-vendor is not manufacturer of proven Booster Fans as per clause 4.01.01 (a) above but is a manufacturer of such equipment for units of at least 500 MW rating, the Bidder or the proposed sub vendor can manufacture such equipment for 660 MW units also, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (a) above for the Booster Fans. A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.01.01 above in India, can also manufacture such equipment(s), provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.01 above (or the technology provider of the qualified equipment manufacturer) for the respective equipment(s). Before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s). Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later. In case the Bidder or the proposed sub-vendor is not manufacturer of proven Oxidation Blowers as per clause 4.01.01 (c) above but is a manufacturer of Blowers/compressors for minimum 50 NM³/min capacity, the Bidder or the proposed sub-vendor can also manufacture Oxidation Blowers, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Oxidation Blowers in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (c) above for the Oxidation Blowers. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments. (i) In case the Bidder or the proposed sub-vendor is not manufacturer of proven Wet limestone Grinding mills as per clause 4.01.01 (d) above but is a manufacturer			
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	of dry Grinding mills for power or cement industry of minimum 20 T/h capacity, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding mills, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Wet limestone Grinding mills in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (d) above for the Wet limestone Grinding mills. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments. In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Wet limestone Grinding mills. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 10 Million (Indian Rupees Ten Million only) for each project. OR (ii) In case, the bidder or proposed sub vendor is not a manufacturer of proven Wet Limestone Grinding Mills as per clause 4.01.01 (d) above, but have designed, manufactured & supplied dry Grinding Ball Tube mills for at least 500 MW pulverized coal fired power plant, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding Mills provided it has a licensing agreement with a Wet limestone Grinding mills manufacturer who meet the requirements stipulated at clause 4.01.01 (d) above for the Wet limestone Grinding mills and provides extended warranty of three (3) years for the Wet Limestone Grinding Mills. In such a case Bidder shall provide an additional on demand bank guarantee for INR 10 Million (Indian Rupees Ten Million only) for each project.			
4.01.06	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Agitators as per clause 4.01.01 (f) above but is a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry, the Bidder or the proposed sub-vendor can also manufacture Agitators, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Agitators in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (f) above for the Agitators. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.			
4.01.07	In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.01 (e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps,			
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	provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (e) above for the Slurry Recirculation Pumps. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.			
4.01.08	Before taking up the manufacturing of such equipment(s) as per clause 4.01.02, 4.01.03, 4.01.04, 4.01.05(i), 4.01.06 & 4.01.07 above, the Bidder / its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator / licenser's design, manufacturing and quality control system for such equipments duly certified by the Collaborator / licensor. Further, the Collaborator / Licenser shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.			
4.01.09	Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licenser(s) proposed by the Bidder for the above equipment(s) is qualified.			
4.01.10	The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.			
	Note to clause 4.01.01 (1) Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/Anthracite Coal/lignite.			
4.02.00	Sub QR for Civil Works:			
4.02.01	Bidder or its agency should have in past executed civil and structural works for 500 MW or higher capacity coal based/Lignite based power plant including earthwork in filling involving mechanical compaction and cutting in hard rock, foundations, Bulk material handling plant involving underground storage hopper and underground tunnels.			
4.02.02	Bidder can engage more than one agency, in case the Bidder itself is not able to meet the requirement at 4.02.01. The agency being engaged for a particular work should have in the past executed such works of 500 MW or higher capacity plant.			
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4.02.03	For Chimney, Bidder or its agency should have in the past built at least one (1) reinforced concrete chimney of minimum 100m height.			
4.02.04	In case Bidder or its agency do not meet the requirements at 4.02.01 and the Bidder proposes to engage agency (ies) for civil & structural works on work volume basis (except for Chimney), Bidder or its agency (ies) should have executed such works in the past and the annual rate of execution in the reference works should not be less than eighty percent (80%) of the asking rate of such works, (structural steel fabrication & erection, RCC, earthwork in filling involving mechanical compaction and cutting in hard rock, RCC in underground storage hopper and underground tunnels) for which it is being engaged.			
4.02.05	Successful Bidder shall finalize the agency (ies) for each work in consultation with Engineer-in-charge at site before engaging them. Design agency for Civil & Steel Structural Works: Bidder or its agency (ies) should have carried out the design and detailed engineering of following works: (i) Civil & Structural works associated with at least one bulk material handling plant for 500 MW or higher capacity coal based/Lignite based power plant. (ii) For Chimney, Bidder or its design agency (ies) should have carried out design & detailed engineering of at least one reinforced concrete chimney with steel flues, of minimum 100m height. (iii) Machine foundations such as Mill foundations/ Block foundations.			
4.02.06	Bidder can engage more than one agency (of repute), in case the Bidder itself is not able to meet the requirement at 4.02.05. The design agency (ies) proposed by the Bidder shall be subject to Employer's approval.			
~~4.03.00~~	~~PROVENNESS CRITERIA FOR ELECTRICAL EQUIPMENTS~~			
~~4.03.01~~	~~HT MOTORS~~			
4.03.01.01	~~BOOSTER FAN MOTOR~~ The offered Squirrel cage Induction motor shall be from such a Manufacturer who has manufactured and supplied motor of 4MW or above rating, which should have been in successful operation for at least one (1) plant for a period not less than one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
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~~4.03.02~~	~~LT SWITCHGEAR~~			
~~4.03.02.01~~	~~ROUTE 1~~			
4.03.02.01	(i) Bidder/ Sub Vendor should have manufactured and supplied at least a total of four hundred & fifty (450) nos. draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for 1 second and 105kA peak under a single order and these panels should have been in successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.02.01	(ii) Bidder/ Sub Vendor should have manufactured and supplied at least one hundred & fifty (150) nos. of Air Circuit Breakers having fault rating of at least 105kA MAKING and 45kA BREAKING, and their associated draw out type Air circuit breaker panels having fault rating of at least 45kA for 1 Second and 105kA peak, which should have been in successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
~~4.03.02.02~~	~~ROUTE 2~~			
4.03.02.02	(i) Bidder/Sub-vendor should have manufactured and supplied at least a total of two hundred & twenty five (225) nos. draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for 1 second and 105kA peak under a single order and these panels should have been in successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.02.02	(ii) Bidder/Sub-vendor should have manufactured and supplied at least seventy five (75) nos. of draw out type Air Circuit Breaker panels having fault rating of at least 45kA for 1 second and 105kA peak, which should have been in successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.02.02	(iii) Bidder/Sub-vendor shall Associate/Collaborate with a manufacturer who meets the requirements stipulated in Route 1. In such a case, Bidder/Sub-vendor should furnish a Deed of Joint Undertaking executed by Bidder/Sub-vendor and its Associate/Collaborator as per the format enclosed in the bidding document in which the Bidder/Sub-vendor and its Associate/Collaborator are jointly and severally liable to the Employer for successful performance of the LT Switchgears under this package. This Deed of Joint Undertaking should be submitted prior to the placement of order on approved Sub Vendor. In case of award, the Associate or Collaborator of the Bidder / Sub Vendor (as applicable) will be required to			
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	furnish an on-demand Bank Guarantee for INR 1 Million (Indian Rupees One Million only) per project. Note: Each Single Front Panel shall be counted as one (1) Panel, Double Front Panel as one (1) Panel and Air Circuit Breaker Panel as one (1) Panel.			
4.03.03	11 KV / 3.3 KV SWITCHGEARS			
	Route 1			
4.03.03.01	The Bidder/ Sub Vendor should have manufactured and supplied on an average one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels per annum during the last three years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.03.02	The Bidder/ Sub Vendor should have designed, manufactured and supplied at least one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels complete in all respects with fault rating of at least 40kA for one (1) second and 100kA (peak), which should have been in successful operation for a period of at least two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.03.03	The Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of Vacuum Circuit Breakers for 11kV and /or 6.6kV panels with a rating of 40kA rms BREAKING, 100kA peak MAKING and 40kA withstand for one (1) second, which should have been in successful operation in 6.6kV or higher voltage application for a period of at least two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
	Route 2			
	Bidder/ Sub Vendor based on technological support of its Associate or Collaborator, can also participate provided			
4.03.03.04	The Bidder/ Sub Vendor should have manufactured and supplied on an average one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels per annum during the last three years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.03.05	The Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels complete in all respects with fault rating of at least 40kA for one (1) second and 100kA (peak). The Bidder/ Sub Vendor should have type tested the offered type of panels as specified.			
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-0011-109-(1A)2		SUB-SECTION-I INTENT OF SPECIFICATION
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4.03.03.06	The Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of Vacuum Circuit Breakers for 11kV and /or 6.6kV panels with a rating of 40kA rms BREAKING, 100kA peak MAKING and 40kA withstand for one (1) second, reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.03.07	Bidder's/ Sub Vendor's Associate or Collaborator meets the qualifying requirement stipulated at 4.03.03.02 & 4.03.03.03 stipulated under Route 1.			
4.03.03.08	Bidder/ Sub Vendor furnishes a Deed of Joint Undertaking jointly executed by it and its Associate/ Collaborator as per format enclosed in the bidding document in which the Bidder/ Sub Vendor and its Associate/ Collaborator are jointly and severally liable to the Employer for successful performance of the MV Switchgears. This Deed of Joint Undertaking should be submitted prior to the placement of order on approved Sub Vendor. In case of award, the Associate or Collaborator of the Bidder / Sub Vendor (as applicable) will be required to furnish an on-demand Bank Guarantee for INR 1 Million (Indian Rupees One Million only) per project. Note: Equipment designed by the Bidder itself or through its Collaborator/Associate for reference plant, shall also be considered meeting the requirement of design.			
4.03.04	NUMERICAL RELAYS & NETWORKING			
4.03.04.01	Numerical Relays shall be offered from a Manufacturer who has manufactured and supplied and successfully configured at least 100 No's of Numerical Relays with IEC 61850 used for application in Feeder Protections/Transformer Protections/Motor Protections. These relays should have been in successful operation for at least one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.04.02	The Numerical Relay Network system shall be offered from an Integrator /Manufacturer who has designed and successfully done FAT for a network on IEC 61850 with at least 100 no's of Communicable Numerical Relays reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.05	AUXILIARY OIL FILLED TRANSFORMERS			
4.03.05.01	The Bidder/ Sub-Vendor should have manufactured & supplied at least two numbers (one each at two different installations) of 16 MVA, 11KV or higher rating oil filled transformers which should have been in successful operation for a period of at least two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
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	And 4.03.05.02 Bidder/ Sub-Vendor should have his own facilities for conducting all routine and type tests as per IS: 2026 (except short circuit test). And 4.03.05.03 16 MVA, 11 KV Class or higher rated oil filled transformer manufactured by Bidder/ Sub-Vendor should have been successfully short circuit tested. Note: i) Two different installations mean two different project sites or two different contracts. ii) Equipment designed by the Bidder/Sub-vendor by itself or through its Collaborator/Associate for reference plant, shall also be considered meeting the requirement of design. 4.04.00 FGD WASTE WATER TREATMENT SYSTEM FOR ZERO LIQUID DISCHARGE (ZLD) 4.04.01 Route-1 4.04.01.01 Bidder/Bidder's Sub vendor should have designed, supplied, erected/supervised erection and commissioned/supervised commissioning at least one (1) number of FGD Waste Water Treatment System (essentially comprising of Evaporator (Brine Concentrator) and/or Crystalliser, Vapour Compressor) operating in Coal fired unit(s) of power plant, having inlet feed as FGD waste water of TDS not less than 30,000 ppm and treatment capacity of not less than 10 m³/hr. The above FGD Waste Water Treatment System should have been in successful operation for a period not less than one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder. 4.04.02 Route-2 4.04.02.01 The Bidder/its Sub-vendor who do not meet the qualification requirements stipulated at 4.04.01.01 above, may also participate provided the Bidder/its Sub vendor is a contractor who have designed, supplied, erected/supervised erection and commissioned/supervised commissioning at least one (1) number of Waste Water Treatment System (essentially comprising of Evaporator (Brine Concentrator) and/or Crystalliser) operating in an Industrial unit which should have been in successful operation for a period not less than one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder and associates/collaborates with an Associate/Collaborator who in turn fully meets the requirements stipulated at 4.04.01.01 above. 4.04.02.02 Bidder/its sub vendor should also have a valid ongoing collaboration and technology transfer agreement with an Associate/Collaborator meeting requirements of clause 4.04.01.01 above, valid minimum up to the end of the defect liability period of the		
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	contract. In such a case Bidder/Sub vendor can either source the FGD Waste Water Treatment System from such system provider or can itself manufacture/get manufactured, supply and install the FGD Waste Water Treatment System as per the design, manufacturing and installation drawings released by such Associate/Collaborator.																					
4.04.02.03	The Bidder shall furnish a Deed of Joint Undertaking (DJU) executed by it, its Sub vendor (if applicable) and the Collaborator/Associate and each executant of DJU shall be jointly and severally liable to the Employer for successful performance of FGD waste water treatment system. The Deed of Joint Undertaking(s) (DJU) should be submitted at the time of placement of order on approved Sub vendor. In case of award, the Associate or Collaborator of the Bidder/Sub-vendor (as applicable) shall be required to furnish an on demand bank guarantee for INR 20 Million (Rupees Twenty Million) for each project.																					
4.05.00	Provenness criteria for critical equipment, auxiliaries, systems and bought out items for FGD waste water system:																					
4.05.01	The Bidder/Bidder's sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for critical equipment, auxiliaries, system and bought out items as per criteria stipulated below: Evaporator/Brine Concentrator, Crystallizer, Mechanical Vapour Compressor, Evaporator feed Heat exchanger, Crystalliser Heat exchanger for FGD Waste Water System for ZLD offered by the Bidder shall be only from such manufacturer(s) who has previously designed (either by itself or under collaboration/licensing agreement), manufactured/got manufactured the respective equipment(s) of the type, application and minimum equipment rating not less than that supplied in FGD waste water application and such equipment(s) should have been in successful operation in at least one (1) coal fired power station for a period not less than one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.																					
	<table><tr><th>Sl. No</th><th>Name of Equipment</th><th>Type of Equipment</th><th>Application</th><th>Equipment Rating</th></tr><tr><td>a)</td><td>Evaporator/Brine concentrator</td><td>Falling Film</td><td>FGD application in Coal fired power plant</td><td>Evaporator/Brine concentrator of a FGD Waste water treatment system of capacity not less than 10 m³/hr.</td></tr><tr><td>b)</td><td>Crystallizer</td><td>Forced circulation</td><td>FGD application in Coal fired power plant</td><td>Crystallizer of a FGD Waste water treatment system of capacity not less than 10 m³/hr.</td></tr><tr><td>c)</td><td>Mechanical Vapour Compressor</td><td>Centrifugal</td><td>FGD application in Coal fired power plant</td><td>Mechanical Vapour Compressor of a FGD Waste water treatment system of capacity not less than 10 m³/hr.</td></tr></table>	Sl. No	Name of Equipment	Type of Equipment	Application	Equipment Rating	a)	Evaporator/Brine concentrator	Falling Film	FGD application in Coal fired power plant	Evaporator/Brine concentrator of a FGD Waste water treatment system of capacity not less than 10 m³/hr.	b)	Crystallizer	Forced circulation	FGD application in Coal fired power plant	Crystallizer of a FGD Waste water treatment system of capacity not less than 10 m³/hr.	c)	Mechanical Vapour Compressor	Centrifugal	FGD application in Coal fired power plant	Mechanical Vapour Compressor of a FGD Waste water treatment system of capacity not less than 10 m³/hr.	
Sl. No	Name of Equipment	Type of Equipment	Application	Equipment Rating																		
a)	Evaporator/Brine concentrator	Falling Film	FGD application in Coal fired power plant	Evaporator/Brine concentrator of a FGD Waste water treatment system of capacity not less than 10 m³/hr.																		
b)	Crystallizer	Forced circulation	FGD application in Coal fired power plant	Crystallizer of a FGD Waste water treatment system of capacity not less than 10 m³/hr.																		
c)	Mechanical Vapour Compressor	Centrifugal	FGD application in Coal fired power plant	Mechanical Vapour Compressor of a FGD Waste water treatment system of capacity not less than 10 m³/hr.																		
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CLAUSE NO.	INTENT OF SPECIFICATION 				
4.05.02	Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating
	d)	Evaporator feed Heat Exchanger	Plate type /Tube & Shell type	FGD application in Coal fired power plant	Evaporator feed Heat Exchanger of a FGD Waste water treatment system of capacity not less than 10 m ³ /hr.
	e)	Crystallizer Heat Exchanger	Plate type/Tube & Shell type	FGD application in Coal fired power plant	Crystallizer Heat Exchanger of a FGD Waste water treatment system of capacity not less than 10 m ³ /hr.
	Bidder shall offer and supply only the type of the above equipment(s) for which he himself or the manufacturer proposed by the Bidder for the above equipment(s) is qualified.				
	A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.05.01 above in India can also manufacture such equipment(s), provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.05.01 above (or the technology provider of the qualified equipment manufacturer) for the respective equipment(s). Before taking up the manufacturing of such equipment(s), the bidder/his sub-vendor(s) must create/have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s). Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its Holding company/Subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/Subsidiary or upto the end of defect liability period of the contract, whichever is later.				
4.05.03	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Evaporator/Brine concentrator as per clause 4.05.01 (a) above but is a manufacturer of Evaporator/Brine concentrator for any Industrial unit, the Bidder or the proposed sub-vendor can also manufacture Evaporator/Brine concentrator, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Evaporator/Brine concentrator in India with such manufacturer who meet the requirements stipulated at clause 4.05.01 (a) above for the Evaporator/Brine concentrator. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.				
4.05.04	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Crystallizer as per clause 4.05.01 (b) above but is a manufacturer of Crystallizer for any Industrial unit, the Bidder or the proposed sub-vendor can also manufacture Crystallizer, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Crystallizer in India with such				
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	manufacturer who meet the requirements stipulated at clause 4.05.01 (a) above for the Crystallizer. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.			
4.05.05	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Mechanical Vapour Compressor as per clause 4.05.01 (c) above but is a manufacturer of Compressor, the Bidder or the proposed sub-vendor can also manufacture Mechanical Vapour Compressor, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Mechanical Vapour Compressor in India with such manufacturer who meet the requirements stipulated at clause 4.05.01 (c) above for the Mechanical Vapour Compressor. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.			
4.05.06	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Evaporator feed Heat Exchanger as per clause 4.05.01 (d) above but is a manufacturer of Heat exchanger, the Bidder or the proposed sub-vendor can also manufacture Evaporator feed Heat Exchanger, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Evaporator feed Heat Exchanger in India with such manufacturer who meet the requirements stipulated at clause 4.05.01 (d) above for the Evaporator feed Heat Exchanger. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.			
4.05.07	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Crystallizer Heat Exchanger as per clause 4.05.01 (e) above but is a manufacturer of Heat exchanger, the Bidder or the proposed sub-vendor can also manufacture Crystallizer Heat Exchanger, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Crystallizer Heat Exchanger in India with such manufacturer who meet the requirements stipulated at clause 4.05.01 (e) above for the Crystallizer Heat Exchanger. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.			
4.05.08	Before taking up the manufacturing of such equipment(s) as per clause 4.05.03, 4.05.04, 4.05.05, 4.05.06, 4.05.07 above, the Bidder/its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator/licenser's design, manufacturing and quality control system for such equipments duly certified by the Collaborator/licensor. Further, the Collaborator / Licensor shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.			
LOT-1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-0011-109-(1A)2	SUB-SECTION-I INTENT OF SPECIFICATION	PAGE 18 OF 19

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4.05.09	Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licenser(s) proposed by the Bidder for the above equipment(s) is qualified.		
4.05.10	The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.		
	Note to clause 4.04.00 & 4.05.00 Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/Anthracite Coal/lignite.		
4.06.00	Agency for Wet Stack Flow Model Study Wet Stack Flow Model Study shall be carried out by an agency which has successfully performed at least two (2) flow model studies, in separate coal fired power plants, of wet stack installed after wet limestone based FGD Absorber (without reheating of cleaned flue gas), and based on the studies developed at least two (2) wet stack liquid collection systems which are in successful operation for a period of at least two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.		
4.07.00	Balance equipments/ systems The Bidder at his option can source the balance of plant equipment/systems not covered in clause 4.01.00, 4.02.00, 4.03.00, 4.04.00, 4.05.00 & 4.06.00 above. However for such balance of plant equipment/systems, the Employer reserves the rights to satisfy himself on the provenness of the equipment and capability and capacity of the manufacturers.		
4.08.00	Notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/ licensor/ his sub-contractors to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.		
4.09.00	To enable the approval of sub-vendors, the Bidder shall provide all necessary data such as type, design, make, capacity, duty conditions, date of commissioning/ operation etc.		
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SUB-SECTION-II-A8

PROJECT INFORMATION- NABINAGAR-I 3X660 MW

LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-0011-109(1A)-2

CLAUSE NO.	PROJECT INFORMATION			
1.00.00	BACKGROUND A Joint Venture Agreement was signed between NTPC and BSEB/ Govt. of Bihar on 14.02.2008 for Establishment and Operation & Maintenance of 3x660 MW capacity coal based thermal power project near Nabinagar Distt Aurangabad Bihar and thereafter a Joint Venture company namely, Nabinagar Power Generating Company Private Limited (NPGCPL) was incorporated with equity structure of 50% each by NTPC and BSEB on 09.09.2008.The project shall be a mega project and shall be implemented during XII Plan period.			
1.01.00	Location The plant is located in Aurangabad district of Bihar at a distance of about 15 kms. from Barun in Aurangabad district of Bihar and is approachable from NH-2 through a 20 kms (approx.) long single lane metalled road. The Aurangabad city is about 55 kms. from project site. Nearest railway station is Ankorha on Sone – Garwa Road Section of Eastern Central Railway at about 1.0 Kms. from the project site. Airport The nearest airport at Gaya is at a distance of about 120 Kms from project site. The distances of site from Patna Airport and Varansi Airport are about 250 Kms & 220 Kms respectively. Vicinity plan of the proposed project is placed at Annexure -I			
1.02.01	Land About 2500 acres of land required for the project (main plant, township, ash disposal areas and corridors etc.) has been identified. Govt. of Bihar have accorded in-principle clearance for availability of land vide letter dated 15.06.2007 and 27.02.2009.			
1.02.02	Coal Coal requirement for the project is estimated about 11.25 million tonnes/annum corresponding to 90% PLF. Likely coal source for the project is North Karanpura coalfields of CCL. Application for Long Term Coal Linkage has been submitted to Ministry of Coal, Govt. of India on 21.06.2007 & 06.10.2008.			
1.02.03	Water The project site is located near the river Sone and the make up water requirement for the project is proposed to be drawn from the pondage created by Indrapuri Barrage on river Son, which is about 3 kms from the proposed site. Make up water requirement for this project would be about 7550 Cu.M/hr with ash water recirculation system and about 8480 Cu.M/hr with once through ash water system.			
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CLAUSE NO.	PROJECT INFORMATION			
1.03.00	Govt. of Bihar has accorded water commitment for availability of 125 cusecs of water vide letter dated 06.06.2007. Railway Siding Employer intends to construct the Railway siding to project site from the nearest existing railway line. However, the same may not be available to the bidder for his use to transport equipment & material. Bidder may visit the site and acquaint themselves with the facilities available.			
1.04.00	(i) Coal Quality Parameters / Fuel Oil Characteristics & Plant Water details: The coal quality parameters and Fuel oil Characteristics are indicated in Table-1 & Table-2A & 2B resp. below. Water data (ii) Process water: Source: Terminal point: Process water quality is based on COC given in Table-3. (iii) Clarified water: Terminal point: Clarified water quality is indicated in Table-3. (iv) DM water for Equipment cooling water system. Terminal point: DM water quality is indicated in Table-4.			
1.05.00	Steam Generator and ESP data: refer Table-5.			
1.06.00	Drawings are enclosed as per Table-6 for initial overview to the Bidder.			
2.00.00	NOT USED			
3.00.00	Capacity : 3 x 660 MW			
4.00.00	Metrological Data Important meteorological data from nearest observatory at Dehri is placed at Annexure -II.			
5.00.00	CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1 to Part 4). Pending finalization			
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 2 - OF 31

CLAUSE NO.	PROJECT INFORMATION															
	of Part 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for embankments. A site specific seismic study has been conducted for the project site. The peak ground horizontal acceleration for the project site, the site specific acceleration spectral coefficients (in units of gravity acceleration 'g') in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Appendix-I. Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values. The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4). The site specific acceleration spectra along with multiplying factors specified in Appendix-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 to Part 4). Damping in Structures The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for: <table><tr><td>a) Steel structures</td><td>:</td><td>2%</td></tr><tr><td>b) Reinforced Concrete structures</td><td>:</td><td>5%</td></tr><tr><td>c) Reinforced Concrete Stacks</td><td>:</td><td>3%</td></tr><tr><td>d) Steel stacks</td><td>:</td><td>2%</td></tr></table> Method of Analysis Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be				a) Steel structures	:	2%	b) Reinforced Concrete structures	:	5%	c) Reinforced Concrete Stacks	:	3%	d) Steel stacks	:	2%
a) Steel structures	:	2%														
b) Reinforced Concrete structures	:	5%														
c) Reinforced Concrete Stacks	:	3%														
d) Steel stacks	:	2%														
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 3 - OF 31													

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	performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1). In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893 (Part 1). The spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the structure falls to the left of the peak in the spectral acceleration curve. For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear ($\bar{V}_B$) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using site specific acceleration spectra with appropriate multiplying factor, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of $\bar{V}_B/ V_B$. However, no reduction is permitted if $\bar{V}_B$ is less than V_B. For regular buildings less than 12m in height, design seismic base shear and its distribution to different floor levels along the height of the building may be carried out as specified under clause 7.5, 7.6 & 7.7 of IS:1893 (Part 1) and using site specific design acceleration spectra. The design horizontal acceleration spectrum value (A_h) shall be computed for the fundamental natural period as per clause 7.6 of IS:1893 (Part 1) using site specific spectral acceleration coefficients with appropriate multiplying factor given in Appendix-I. Design/Detailing for Ductility for Structures The site specific design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.		
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 4 - OF 31

CLAUSE NO.	PROJECT INFORMATION			
	APPENDIX – I SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT The various site specific seismic parameters for the project site shall be as follows: 1) Peak ground horizontal acceleration : 0.16g 2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra a) for ordinary moment resisting steel frames designed and detailed as per IS:800 : 0.04 b) for braced steel frames designed and detailed as per IS:800 : 0.03 c) for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920 : 0.024 d) For RCC chimney : 0.08 e) For Liquid retaining tanks : 0.048 d) for Steel chimney and Absorber tower : 0.06 d) for design of structures not covered under 2 (a) to 2 (f) above and under 3 below : 0.04 3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted : 0.08 Note: g = Acceleration due to gravity The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages.			
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 5 - OF 31

CLAUSE NO.	PROJECT INFORMATION																																																																																																																																																														
	APPENDIX – I HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS In units of ‘g’ for BRBCL project <table><tr><th rowspan="2">Time Period (Sec)</th><th colspan="3">Damping Factor (as a percentage of critical damping)</th></tr><tr><th>2%</th><th>3%</th><th>5%</th></tr><tr><td>0.000</td><td>1.000</td><td>1.000</td><td>1.000</td></tr><tr><td>0.030</td><td>1.000</td><td>1.000</td><td>1.000</td></tr><tr><td>0.050</td><td>1.750</td><td>1.607</td><td>1.443</td></tr><tr><td>0.100</td><td>3.737</td><td>3.060</td><td>2.374</td></tr><tr><td>0.104</td><td>3.904</td><td>3.174</td><td>2.443</td></tr><tr><td>0.123</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.150</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.200</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.250</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.300</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.350</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.400</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.450</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.500</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.516</td><td>3.904</td><td>3.401</td><td>2.753</td></tr><tr><td>0.550</td><td>3.662</td><td>3.401</td><td>2.753</td></tr><tr><td>0.600</td><td>3.357</td><td>3.142</td><td>2.753</td></tr><tr><td>0.607</td><td>3.320</td><td>3.105</td><td>2.753</td></tr><tr><td>0.670</td><td>3.006</td><td>2.813</td><td>2.493</td></tr><tr><td>0.700</td><td>2.877</td><td>2.693</td><td>2.386</td></tr><tr><td>0.750</td><td>2.685</td><td>2.513</td><td>2.227</td></tr><tr><td>0.800</td><td>2.518</td><td>2.356</td><td>2.088</td></tr><tr><td>0.850</td><td>2.369</td><td>2.218</td><td>1.965</td></tr><tr><td>0.900</td><td>2.238</td><td>2.094</td><td>1.856</td></tr><tr><td>0.950</td><td>2.120</td><td>1.984</td><td>1.758</td></tr><tr><td>1.000</td><td>2.014</td><td>1.885</td><td>1.670</td></tr><tr><td>1.050</td><td>1.918</td><td>1.795</td><td>1.590</td></tr><tr><td>1.100</td><td>1.831</td><td>1.714</td><td>1.518</td></tr><tr><td>1.150</td><td>1.751</td><td>1.639</td><td>1.452</td></tr><tr><td>1.200</td><td>1.678</td><td>1.571</td><td>1.392</td></tr><tr><td>1.250</td><td>1.611</td><td>1.508</td><td>1.336</td></tr><tr><td>1.300</td><td>1.549</td><td>1.450</td><td>1.285</td></tr><tr><td>1.350</td><td>1.492</td><td>1.396</td><td>1.237</td></tr><tr><td>1.400</td><td>1.439</td><td>1.346</td><td>1.193</td></tr><tr><td>1.450</td><td>1.389</td><td>1.300</td><td>1.152</td></tr><tr><td>1.500</td><td>1.343</td><td>1.257</td><td>1.113</td></tr><tr><td>1.550</td><td>1.299</td><td>1.216</td><td>1.077</td></tr></table>				Time Period (Sec)	Damping Factor (as a percentage of critical damping)			2%	3%	5%	0.000	1.000	1.000	1.000	0.030	1.000	1.000	1.000	0.050	1.750	1.607	1.443	0.100	3.737	3.060	2.374	0.104	3.904	3.174	2.443	0.123	3.904	3.401	2.753	0.150	3.904	3.401	2.753	0.200	3.904	3.401	2.753	0.250	3.904	3.401	2.753	0.300	3.904	3.401	2.753	0.350	3.904	3.401	2.753	0.400	3.904	3.401	2.753	0.450	3.904	3.401	2.753	0.500	3.904	3.401	2.753	0.516	3.904	3.401	2.753	0.550	3.662	3.401	2.753	0.600	3.357	3.142	2.753	0.607	3.320	3.105	2.753	0.670	3.006	2.813	2.493	0.700	2.877	2.693	2.386	0.750	2.685	2.513	2.227	0.800	2.518	2.356	2.088	0.850	2.369	2.218	1.965	0.900	2.238	2.094	1.856	0.950	2.120	1.984	1.758	1.000	2.014	1.885	1.670	1.050	1.918	1.795	1.590	1.100	1.831	1.714	1.518	1.150	1.751	1.639	1.452	1.200	1.678	1.571	1.392	1.250	1.611	1.508	1.336	1.300	1.549	1.450	1.285	1.350	1.492	1.396	1.237	1.400	1.439	1.346	1.193	1.450	1.389	1.300	1.152	1.500	1.343	1.257	1.113	1.550	1.299	1.216	1.077
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6.00.00	APPENDIX – I HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS In units of ‘g’ for BRBCL project <table><tr><th rowspan="2">Time Period (Sec)</th><th colspan="3">Damping Factor (as a percentage of critical damping)</th></tr><tr><th>2%</th><th>3%</th><th>5%</th></tr><tr><td>3.500</td><td>0.575</td><td>0.539</td><td>0.477</td></tr><tr><td>3.550</td><td>0.567</td><td>0.531</td><td>0.470</td></tr><tr><td>3.600</td><td>0.559</td><td>0.524</td><td>0.464</td></tr><tr><td>3.650</td><td>0.552</td><td>0.516</td><td>0.458</td></tr><tr><td>3.700</td><td>0.544</td><td>0.509</td><td>0.451</td></tr><tr><td>3.750</td><td>0.537</td><td>0.503</td><td>0.445</td></tr><tr><td>3.800</td><td>0.530</td><td>0.496</td><td>0.439</td></tr><tr><td>3.825</td><td>0.527</td><td>0.493</td><td>0.437</td></tr><tr><td>3.850</td><td>0.523</td><td>0.490</td><td>0.434</td></tr><tr><td>3.900</td><td>0.516</td><td>0.483</td><td>0.428</td></tr><tr><td>3.950</td><td>0.510</td><td>0.477</td><td>0.423</td></tr><tr><td>4.000</td><td>0.504</td><td>0.471</td><td>0.418</td></tr></table>				Time Period (Sec)	Damping Factor (as a percentage of critical damping)			2%	3%	5%	3.500	0.575	0.539	0.477	3.550	0.567	0.531	0.470	3.600	0.559	0.524	0.464	3.650	0.552	0.516	0.458	3.700	0.544	0.509	0.451	3.750	0.537	0.503	0.445	3.800	0.530	0.496	0.439	3.825	0.527	0.493	0.437	3.850	0.523	0.490	0.434	3.900	0.516	0.483	0.428	3.950	0.510	0.477	0.423	4.000	0.504	0.471	0.418
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	CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT All structures shall be designed for wind forces in accordance with IS:875 (Part-3) and as specified in this document. See Annexure – B for site specific information. Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard. Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor Method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method. Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than “5” and/or if the fundamental frequency of the structure is less than 1 Hz. Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards. It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement																																																										
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	factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects. Damping in Structures The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for: a) Welded steel structures : 1.0% b) Bolted steel structures : 2.0% c) Reinforced concrete structures : 1.6% d) Steel stacks : As per IS:6533 & CICIND Model Code whichever is more critical. <u>ANNEXURE-B</u> <u>SITE SPECIFIC DESIGN PARAMETERS</u> The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows: a) The basic wind speed “V_b” at ten b) The risk coefficient “K₁” : 1.07 c) Category of terrain : Category-2			
7.00.0	FOUNDATION SYSTEM AND GEOTECHNICAL DATA			
7.00.01	Geotechnical data and foundation system for the respective project are enclosed at annexure-III. The corresponding bore logs are enclosed at annexure-IV.			
7.00.02	The available soil data is of vicinity of proposed structures, therefore, bidder shall carryout his own detailed soil investigation for facilities under this package and shall be as per the scheme approved by owner. The scheme for geotechnical investigation shall be as given at Clause 7.07.00 and shall be approved by owner before execution. Geotechnical investigation work shall got executed by the Contractor through the agencies as mentioned in Clause No. 7.07.03. However, no time extension shall be given on account of soil investigation carried out by the Bidder. The geotechnical investigation report shall be prepared with detailed recommendations regarding type of foundation and allowable bearing pressure for various structures/ facilities and other soil parameters. The report shall be submitted for Owner’s approval prior to commencement of design of foundation.			
7.00.03	The Bidder should note that nothing extra whatsoever on account of variation between soil data collected by Owner and that found by the Bidder during geotechnical investigation by him or during execution of works, shall be payable.			
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7.00.04	Tank Foundations a) The tanks shall rest on flexible tank pad foundation, resting on sand with concrete ring wall to retain sand. Base of the concrete ring wall shall not rest on the expansive soil, if any. b) Entire loose/ soft soil inside the concrete ring wall shall be removed and shall be filled with sand. Sand for filling shall be clean and well graded conforming to IS 383 with grading Zone I to III. c) Sand shall be spread in layers not exceeding 30cm compacted thickness over the area. Each layer shall be uniformly compacted by mechanical means like plate vibrators, small vibratory rollers, etc to achieve a relative density of not less than 80%. d) Other requirements of tank foundations shall be as per IS 803 and as specified elsewhere in the specifications.
7.02.00	Foundation System The requirements for the foundation system to be adopted are as given in subsequent clauses. Depending upon the depth of competent strata/stratum, type of structures, functional requirement of facility, extent of cutting / filling, suitable foundation, open or pile shall be adopted with approval of owner.
7.02.01	General Requirements a) All structures/equipment shall be supported either on suitable open foundations (isolated, combined, raft) or pile foundations depending on type of structures/facilities, sub-strata, topography etc. b) The roads, ground floor slabs, trenches, pipe pedestals, channels/drains and staircase foundation with foundation loading intensity less than 4 T / M2 may be supported on open / shallow foundations resting on virgin / controlled compacted filled up soil. c) No other foundation (other than as mentioned in (b) above) shall rest on the filled up ground / soil. d) No foundation shall rest on the black cotton soil. e) Before execution of work the bidder shall ensure that there is no obstruction to underground/overground facilities like sewer lines, pipe lines etc. Any such damage and remedial/ rectification measures shall be at the contractors cost. f) Bidder shall also ensure that there is no damage to existing nearby foundations and the foundations pertaining to this package are not placed at shallower depth than the nearby foundations. If required depth of foundation is deeper than the existing foundations, proper protection shall be provided to existing foundations.
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7.02.02	g) All foundations shall be designed in accordance with relevant parts of the latest revisions of Indian Standards. h) The water table for design purpose shall be considered at Finished Ground Level. i) A combination of open and pile foundations shall not be permitted under the same equipment / structure / building. j) Foundation for equipments on ground floor For equipments of static weight upto 1.5 T, the equipment may be supported on the ground floor slab by locally thickening the slab. Thickening of the ground floor slab shall be done upto an extent of about 0.6 m beyond the plan area of the equipment on all the sides. Further, the load intensity below the equipment shall be limited to 4T/m². Other requirements of floor slab and compaction below the floor slab shall be adhered, as specified elsewhere in the specifications. For equipment of static weight more than 1.5 T, the equipment foundation shall be taken to the founding level or shall be built up with PCC from the level as mentioned in the Table 1. The pedestal of equipment foundation or the foundation Block shall be isolated from the adjoining floor slab by providing bitumen impregnated fiber board of minimum 50 mm thick, conforming to IS: 1838 all around the equipment pedestal for the full depth of the floor slab. Open Foundations In case open foundations are adopted, following shall be adhered to. a) The minimum width of foundation shall be 1.0 m. b) Minimum depth of foundation shall be 1.0m below Ground Level. c) It shall be ensured that all foundations of a particular structure/ buildings/ facility shall rest on one bearing stratum. d) Wherever the intended bearing sub-strata is virgin soil stratum but the actual stratum encountered during foundation excavation consists of filled up soil at founding level, under such cases either the foundation shall be lowered completely into the virgin stratum or the filled up soil upto the virgin layers shall be removed and built up through PCC (1:4:8) up to designed foundation level.			
	7.02.03	Pile Foundations – In case piles are adopted, following shall be adhered to :		
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	i) The pile foundation shall be of RCC, Cast-in-situ bored piles as per IS:2911. Pile boring shall be done using Rotary Hydraulic Rigs/conventional tripod rig. Two stage flushing of pile bore shall be ensured by airlift technique duly approved by the Employer. If required, temporary or permanent MS liner may be provided for piling. ii) The minimum diameter of pile shall be 600 mm. The allowable load capacity of the pile in different modes (vertical compression, lateral and pullout) shall be as per approved geotechnical report & as enclosed in relevant annexure: iii) Only straight shaft piles shall be used. Minimum cast length of pile above cutoff level shall be 1.0 m. iv) The contractor shall furnish design of piles (in terms of rated capacity, length, diameter, termination criteria to locate the founding level for construction of pile in terms of measurable parameter, reinforcement for job as well as test piles, pile load test arrangement, locations of initial test piles etc.) for Engineer's approval. v) The piling work shall be carried out in accordance with IS:2911 (Relevant part) and accepted construction methodology. The construction methodology shall be submitted by the Contractor for Engineer's approval. vi) Number of initial load tests to be performed for each diameter and rated capacity of pile shall be subject to minimum as under. Vertical Lateral Uplift Minimum of 2 Nos. in each mode. vii) The initial pile load test shall be conducted with test load upto three times the estimated pile capacity. In case of vertical compression test (initial test) the method of loading shall be cyclic as per IS:2911 (relevant part). viii) Load test shall be conducted at pile Cut-off Level (COL). If the water table is above the COL the test pit shall be kept dry throughout the test period by suitable de-watering methods. Alternatively the vertical load test may be conducted at a level higher than COL. In such a case, an annular space shall be created to remove the effect of skin friction above COL by providing an outer casing of suitable diameter larger than the pile diameter. ix) Number of routine pile load tests to be performed for each diameter/allowable capacity of pile shall be as under : i) Vertical : 0.5% of the total number of piles provided. ii) Lateral : 0.5% of the total number of piles provided.		
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	x) The routine tests on piles shall be conducted upto test load of one and half times the allowable pile capacity. Piles for routine load tests shall be approved by the Employer. xi) In case, routine pile load test shows that the pile has not achieved the desired capacity or pile(s) have been rejected due to any other reason, then the Contractor shall install additional pile(s) as required and the pile cap design shall accordingly be reviewed and modified, if required. xii) Testing of piles and interpretation of pile load test results shall be carried out as per IS:2911 (Part-4). Contractor shall ensure that all the measuring equipment and instruments are properly calibrated at a reputed laboratory / institute prior to their use. Settlement / movement of the pile top shall be made by Linear Variable Differential Transducers (LVDT) having a least count of 0.01mm. xiii) The test load on initial test piles shall be applied by means of reaction from anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge with concrete blocks. xiv) Low Strain Pile Integrity test shall be conducted on all test piles and job piles. This test shall be used to identify the routine load test and not intended to replace the use of static load test. This test is limited to assess the imperfection of the pile shaft and shall be undertaken by an independent specialist agency to be approved by Engineering department of Owner. The test equipment shall be of TNO or PDI make or equivalent. The process shall confirm to ASTM. xv) High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests. The procedure to carry out the test shall be submitted to the Engineer. The test and equipment shall conform to ASTM D4945-00. The test shall be conducted by an experienced independent test agency approved by the owner. Field data shall be submitted to the site engineer and shall include force velocity curves, pile capacity, simulated static load test curve, net and total pile displacement, pile integrity. A (Case pile wave analysis) CAPWAP or equivalent software analysis shall be conducted on the field data for correct capacity estimation and to evaluate end bearing and skin friction components			
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	of the pile. xvi) From load considerations, single pile may be used under a column/tower. In that case, pile shall be connected with tie beams at pile cut off level in both directions. xvii) Contribution of frictional resistance of filled up soil if any, shall not be considered for computation of frictional resistance of piles. xviii) Reinforcement for job piles shall be designed as following: ▮ Compression + bending piles: For these piles, the allowable safe pile capacities in compression and bending shall be considered. ▮ Tension + bending piles: For these piles, the actual pile forces to be considered. However, maximum 3 types of combinations for varying percentage of tension capacity + bending case may be designed & adopted by contractor for the entire scope of work under this package.			
7.03.00	Special Requirements			
7.03.01	Details of treatment for foundations / underground structures required to counteract soil / water chemical environment shall be as per detailed geotechnical investigation to be carried out by contractor. Contractor shall carry out chemical analysis during detailed geotechnical investigation and required treatment shall be provided accordingly.			
7.04.00	Excavation, Filling and Dewatering			
7.04.01	For excavation works, comprehensive dewatering with well point or deep wells arrangement, if required, shall be adopted. Scheme for dewatering and design with all computations and back up data for dewatering shall be submitted for the owner's information. The water table shall be maintained at 0.5m below the founding depth.			
7.04.02	Excavation for shallow foundations shall be covered with PCC immediately after reaching the founding level. In case of any local loosening of soil or any loose pockets are encountered at founding level during excavation the same shall be removed and compensated by PCC M7.5. The final layer of about 300 mm thickness above the founding level shall be excavated by suitable means, so as to avoid disturbance to founding stratum.			
7.04.03	Backfilling around foundations, pipes, trenches, sumps, pits, plinths, etc. shall be carried out with approved material in layers not exceeding 300 mm compacted thickness (higher thickness of layers upto 500mm with heavy mechanical compacting equipment) and each layer shall be compacted to 90% of standard proctor density for cohesive soils and to 80% of relative density for non-cohesive soils Rock pieces having size less than 150 mm and interstices filled with soil may be used for backfilling around foundation, plinths etc. and shall be compacted to minimum of 85% of original stack of material after filling the interstices.			
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7.04.04	Founding level for trenches/channels shall be decided as per functional requirement. The bottom of excavation shall be properly compacted prior to casting of bottom slab of trenches / channels.			
7.04.05	CBR tests for pavement/road design shall be carried out by the Contractor after earth filling (if applicable) has been completed upto the formation level.			
7.04.06	The contractor shall take all necessary measures during excavation to prevent the hazards of falling or sliding of material or article from any bank or side of such excavation which is more than one and a half meter above the footing by providing adequate piling, shoring, bracing etc. against such bank or sides. Adequate and suitable warning signs shall be put up at conspicuous places at the excavation work to prevent any persons or vehicles falling into the excavation trench. No worker should be allowed to work where he may be stuck or endangered by excavation machinery or collapse of excavations or trenches.			
7.05.00	EXCAVATION IN ROCK Excavation in rock shall be carried out by mechanical means and if blasting is required for founding of some of the structures under this package, control blasting only shall be carried out.			
7.05.01	Controlled blasting shall be done by a specialised agency duly approved by Engineer. All controlled blasting shall be done by using time delay detonators (i.e. excel type).			
7.05.02	a) Contractor shall engage an agency expert in blasting such as, NIRM (National Institute of Rock Mechanics), CMPDIL, Central Institute of Mining and Fuel Research Dhanbad, Dept. of Mining of Govt. Institutions etc. to design detailed blasting scheme and get the same approved from Engineer before carrying out the blasting operation. All blasting shall be done as per the approved blasting scheme & initial blasting operations shall be done under the supervision & guidance of the representative of the blasting expert. b) All the statutory laws, (Explosives Act etc.) rules, regulations, Indian Standards, etc. pertaining to the acquisition, transport, storage, handling and use of explosives, etc. shall be strictly followed. c) The Contractor shall obtain Licenses from Competent Authorities for undertaking blasting work as well as for procuring, transporting to site and storing the explosives as per explosives act. The Contractor shall be responsible for the safe transport, use, custody and proper accounting of the explosive Materials. d) The Contractor shall be responsible and liable for any accident and injury / damage which may occur to any person or property of the project or public on account of any operations connected with the storage, transportation, handling or use of explosive and blasting operations.			
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7.06.00	Sheeting & Shoring The contractor shall ascertain for himself the nature of materials to be excavated and difficulties, if any, likely to be encountered in excavation while executing the work. Sheet piling, sheeting and shoring, bracing and maintaining suitable slopes, drainage, etc. shall be provided and installed by the Contractor, to the satisfaction of the Engineer.		
7.07.00	Geotechnical Investigation The Contractor shall carry out detailed geotechnical investigation in the areas under his scope for establishing the sub-surface conditions and to decide type of foundations for the structures envisaged, construction methods, any special requirements/treatment called for remedial measures for sub-soil/ foundations etc. in view of soft sub-soils, aggressive sub-soils and water, expansive/swelling soils etc. prior to commencement of detailed design/drawings. The Contractor shall obtain the approval for the field testing scheme proposed by him from the Owner before undertaking the geotechnical investigation work.		
7.07.01.00	Scheme of geotechnical Investigation		
7.07.02.01	Field test shall include but not be limited to the following: Boreholes, Standard Penetration Test (SPT), Dynamic Cone Penetration Test (DCPT), collection of disturbed samples (DS) and undisturbed soil samples (UDS), Trial Pits (TP), Plate Load Tests (PLT), Electrical Resistivity Test (ERT), In situ field permeability tests, collection of water samples, etc.		
7.07.02.02	The diameter of borehole shall be minimum 150 mm in soil and 76 mm in rock. The diameter of UDS sampler shall be 100 mm minimum. Core drilling in rock shall be done by using hydraulically feed rotary drill & double tube core barrel with diamond bit.		
7.07.02.03	The minimum tests are indicated in Clause No. 7.08.00. Adequate number of tests shall be conducted up to sufficient depth for complete determination of subsoil conditions. The depth of boreholes shall be as specified in Appendix A. SPT shall be carried out in all types of soil deposits and in all rock formations with core recovery up to 20%, met within a borehole. This test shall be conducted at every 3.0 m interval or at change of strata, up to the final depth. SPT 'N' of 100 and above shall be referred as refusal. UDS shall be collected at every 3.0 m interval or at change of strata up to depth of borehole. UDS may be replaced by additional SPT, if SPT 'N' value in the strata is above 50.		
7.07.02.04	Laboratory tests shall be done as per relevant IS codes. The laboratory tests, not be limited to the following shall be conducted on disturbed and undisturbed soil samples, rock samples & water samples collected during field investigations in sufficient numbers. Laboratory Tests on Soil Samples Laboratory tests shall be carried out on disturbed and undisturbed soil samples for Grain Size Analysis, Hydrometer Analysis, Atterberg Limits, Triaxial Shear Tests (UU), Natural Moisture Content, Specific Gravity and Bulk Unit Weight, Consolidation Tests, Unconfined Compression Test, Free swell Index, Shrinkage Limit, Swell		
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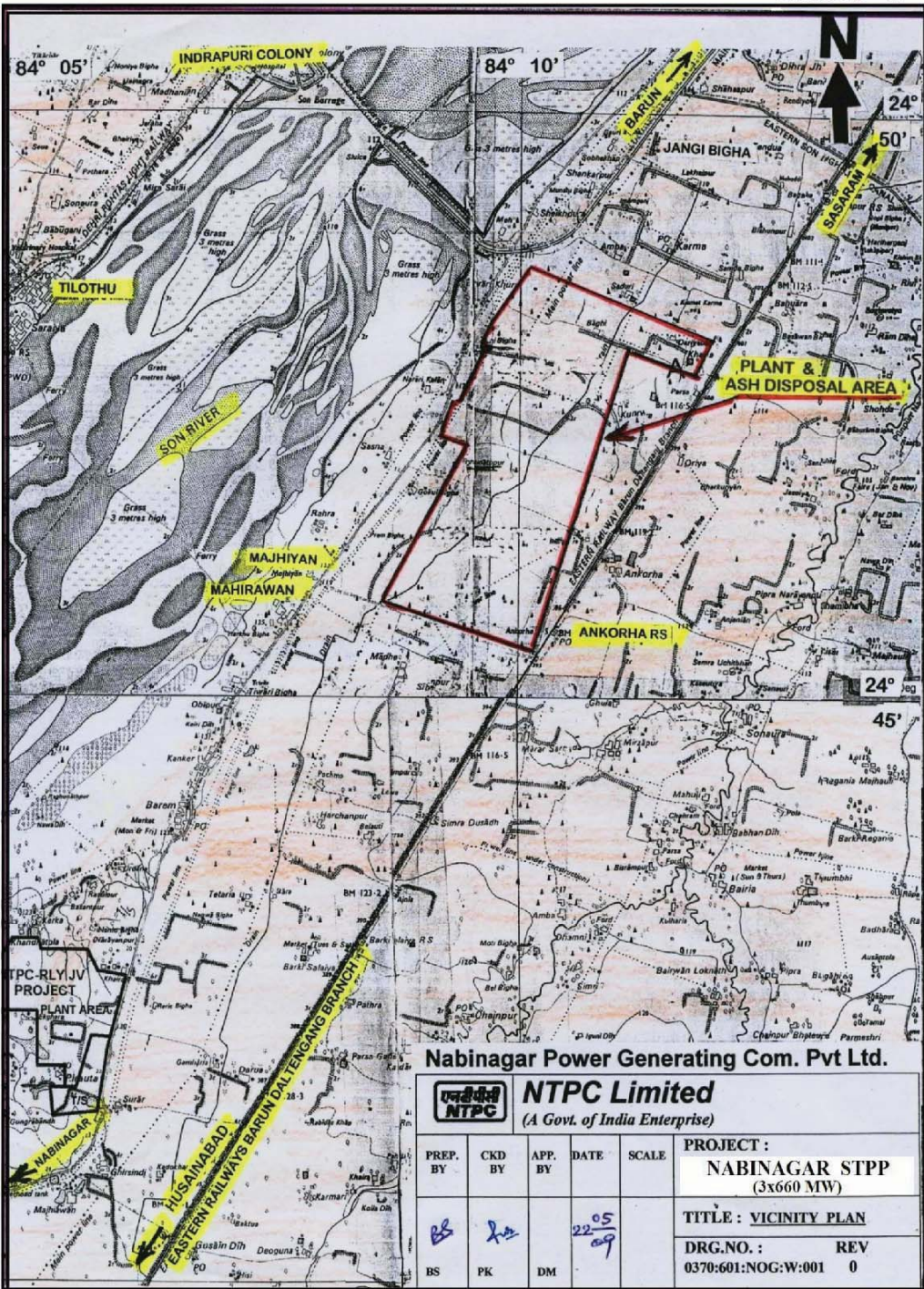
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7.07.02.05	Pressure Test, Chemical Analysis test on soil and water samples to determine the carbonates, sulphates, chlorides, nitrates, pH, organic matter and any other chemicals harmful to concrete and reinforcement/ steel.													
	Laboratory Tests on Rock Samples													
	Moisture content, porosity & density, Specific Gravity, Hardness, Soundness, Slake durability index, Unconfined compression test (Both at saturated and in-situ water content), Point load strength index and deformability test (Both at saturated and in-situ water content) shall be carried out on rock samples.													
	Geotechnical investigation (field & laboratory) shall be carried out in accordance with the provisions of relevant Indian Standards.													
7.07.03.00	On completion of all field & laboratory work, geotechnical investigation report shall be submitted for Owner's review/approval. The Geotechnical investigation report shall contain geological information of the region, procedure adopted for investigation, field & laboratory observations/ data/ records, analysis of results & recommendations on type of foundation for different type of structures envisaged for all areas of work with supporting calculations. Recommendations on treatment for soil, foundation, based on subsoil characteristics, soft soils, aggressive chemicals, expansive soils, etc.													
	Recommendations on foundation system and the net allowable bearing pressures and pile capacity shall be based on the conservative values of geotechnical investigation data.													
	Geotechnical investigation work shall be got executed by the Contractor through the following agencies.													
	1. C.E.TESTING COMPANY Pvt. Ltd, Kolkata 2. Cengrs Geotechnica Pvt. Ltd, New Delhi 3. M.K. Soil Testing Laboratory, Ahemdabad 4. SECON Pvt Ltd, Bangalore 5. Soil Engineering Consultants, New Delhi 6. Orbital Infrastructure Consultancy & Research Pvt. Ltd. Cuttack 7. KCT Consultancy Services, Ahemdabad 8. ARKITECHNO Consultants (India) Pvt. Ltd. Bhubaneswar													
7.08.00	Geotechnical Investigation Scheme													
a)	Boreholes (Minimum)													
	<table><tr><th>S.N</th><th>Structure</th><th>Spacing/Number of borehole</th><th>Depth of borehole</th><th>Remarks</th></tr><tr><td>1</td><td>FGD</td><td>Minimum 14 Nos.</td><td>Depth of boreholes shall be 25m to 35m.</td><td>Depth of</td></tr></table>	S.N	Structure	Spacing/Number of borehole	Depth of borehole	Remarks	1	FGD	Minimum 14 Nos.	Depth of boreholes shall be 25m to 35m.	Depth of			
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	2	Crusher House	Minimum 2 Nos.	Depth of boreholes shall be 25m to 35m.	boreholes shall be as mentioned in column "Depth of Borehole" or 5m continuous in rock with RQD > 25% whichever is earlier.
	3	Gypsum and Lime storage area	Minimum 10 Nos.	Depth of boreholes shall be 15m to 25m	
	4	Other Structure/Facility	Minimum 2 Nos. boreholes under each area / facility	15 to 20 m	
	5	Chimney	Minimum 2 Nos.	30 to 35m	
	b) Other Field Tests (Minimum)				
	1	Cyclic Plate Load Test (CPLT)	3 nos	Test Depth from 2 to 4 m	
	2	Trial Pit (TP)	5 Nos.	Depth - 3 m	
	3	In Situ Permeability Test In Boreholes	In minimum 3 Nos. of boreholes	Tests shall be conducted at depths of 1.0m, 3.0m, 5.0m, 8.0m and 12.0m.	
	4	ERT	Minimum 10 Nos.		
	• Depth and location of Boreholes and other field tests (PLT, ERT, field permeability tests etc.) shall be approved by Owner before execution of geotechnical investigation work. • Investigation in any other building / structure / facilities / trestles which are not mentioned above shall also be carried out, if required, by the bidder for the facilities under his scope.				
	LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2		SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)
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	Annexure-III (New Nabinagar-I) SOIL DATA AND FOUNDATION SYSTEM Employer has carried out geotechnical investigation in the areas near to this package. Logs of representative boreholes to be used for bidder's information in the vicinity of proposed area are enclosed at Annexure-II. The bidder is required to carry out geotechnical investigation as per clause no. 7.07.00 and ascertain the pile capacity and bearing capacity. The onus of correct assessment / interpretation and understanding of the existing subsoil condition / data is on the Bidder. Ground water table is encountered at a depth of about 12.0 to 14.0m below natural ground level (NGL) at the time of investigation. Fluctuation may occur in ground water table due to seasonal variation. The natural ground level is varying as per enclosed contour/spot level drawing. a) The foundation system to be adopted for different structures shall be as given in Table – 1 below 2.00.00Table – 1: Net Allowable Bearing Pressure <table><tr><th>STRUCTURE</th><th>TYPE OF FOUNDATION TO BE ADOPTED</th></tr><tr><td>FGD and related structures</td><td>Open/Piles</td></tr></table> b) During design the Allowable Bearing Pressure shall be as furnished in Table-2. Bidder is required to carry out geotechnical investigation in this area. The allowable bearing pressure shall be adopted after approval of geotechnical investigation report by owner. However, the maximum allowable bearing pressure shall be as per the approved geotechnical report and shall be limited to the values as furnished in Table-2. 3.00.00 4.00.00Table – 2: Net Allowable Bearing Pressure <table><tr><th rowspan="3">Structure</th><th rowspan="3">Foundin g Level in RL</th><th colspan="3">Net Allowable Bearing Pressure T/m²</th></tr><tr><th colspan="2">Isolated / Strip</th><th rowspan="2">Rafts (width > 6m) for 75mm settlement</th></tr><tr><th>width upto 6 m for 25mm settlement</th><th>Width upto 6m for 40mm settlement</th></tr><tr><td rowspan="2">FGD and related structures</td><td>1.5 m below NGL</td><td>5.0</td><td>6.0</td><td>7.0</td></tr><tr><td>2.5 m below</td><td>6.0</td><td>7.0</td><td>8.0</td></tr></table>	STRUCTURE	TYPE OF FOUNDATION TO BE ADOPTED	FGD and related structures	Open/Piles	Structure	Foundin g Level in RL	Net Allowable Bearing Pressure T/m ²			Isolated / Strip		Rafts (width > 6m) for 75mm settlement	width upto 6 m for 25mm settlement	Width upto 6m for 40mm settlement	FGD and related structures	1.5 m below NGL	5.0	6.0	7.0	2.5 m below	6.0	7.0	8.0
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LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 19 - OF 31																					

CLAUSE NO.	PROJECT INFORMATION				
		NGL			
		3.5 m below NGL	9.0	10.0	12.0
	The net allowable bearing pressure higher than above mentioned values shall not be permitted. At intermediate levels the bearing capacity shall be same as the net allowable bearing pressure corresponding to the immediate shallower level mentioned above.				
	c)	Permissible Settlement of Foundations: For open foundations, the total permissible settlement and differential settlement shall be governed by IS: 1904 and from functional requirements whichever is more stringent. However, total settlement shall be restricted to the following:			
		Isolated, Strip & Raft (Mill foundations/machine foundation)	25 mm		
		Isolated & Strip (Other than Mill foundations/machine foundation)	40 mm		
		Raft (widths greater than 6 m) (Other than Mill foundations/machine foundation)	75 mm		
	In case the total permissible settlement is to be restricted to less than as above specified from functional requirements, then the net allowable bearing pressure shall be reduced after review in consultation with Engineer.				
	d)	The diameter of pile, minimum length and maximum allowable capacity of piles shall be as given below:			
		Area/ Location	Pile Diameter (mm)	Minimum Length of Bored Pile Below Cut- off Level (m)	Safe Load Capacity in Vertical Comp. (MT) Pullout (MT) Lateral (MT)
	FGD and related structures	600	26.0	140.0 45.0 7.0	
		760	27.0	250 75.0 12.5	
- Cut off Level (COL) is assumed at 3.0 m below FGL (RL (+) 121.2m). If the COL is shallower than the assumed COL, then the length of the pile shall be increased accordingly.					
e)	The criteria for Pile Termination (founding level) shall be as given below:				
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2		SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	
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	Cement Type	Ordinary Portland Cement (OPC)/Portland Pozzolana Cement (PPC)		
	Concrete Grade	As specified elsewhere in the specifications		
	Type of Reinforcement	As specified elsewhere in the specifications		
	Cover to Reinforcement	As specified elsewhere in the specifications		
	The termination level of the pile shall be decided based on the following criterion			
	i)	Minimum length of the pile below COL (cut off level) shall be as specified above		
	ii)	The minimum pile length for each group of piles shall be determined based on the nearest borelog. A minimum embedment of 4.0m into the very dense sand strata with SPT 'N' value greater than 40 as observed in such borelog shall be ensured, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby borelog data. The boreholes are in the bidder's scope and shall be conducted as per the enclosed scheme.		
	iii)	However, in no case the length of pile shall be less than the minimum length determined as in (i) or (ii) above whichever is longer, for that pile group.		
	g)	Special Requirements:		
	1)	Chemicals in ground water and subsoil, as observed during investigation are:		
	Chemical	SO ₃	Chlorides	pH
	Ground Water	35 -40	15 - 22 ppm	7.2 - 7.7
	Sub-soil	0.01 - 0.02%	0.016 -0.02%	7.0 - 9.0
	2)	In view of the above, the following shall be adopted for all foundations and sub-structures,		
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2		SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)
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CLAUSE NO.	PROJECT INFORMATION																																		
	ANNEXURE – I EXHIBIT - 1  Nabinagar Power Generating Com. Pvt Ltd. NTPC NTPC Limited (A Govt. of India Enterprise) <table><tr><td>PREP. BY</td><td>CKD BY</td><td>APP. BY</td><td>DATE</td><td>SCALE</td><td>PROJECT :</td></tr><tr><td>BS</td><td>PK</td><td>DM</td><td>22-05-09</td><td></td><td>NABINAGAR STPP (3x660 MW)</td></tr><tr><td colspan="5"></td><td>TITLE : VICINITY PLAN</td></tr><tr><td colspan="5"></td><td>DRG.NO. : 0370:601:NOG:W:001</td></tr><tr><td colspan="5"></td><td>REV 0</td></tr></table> <table><tr><td>LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</td><td>TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2</td><td>SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)</td><td>PAGE - 22 - OF 31</td></tr></table>	PREP. BY	CKD BY	APP. BY	DATE	SCALE	PROJECT :	BS	PK	DM	22-05-09		NABINAGAR STPP (3x660 MW)						TITLE : VICINITY PLAN						DRG.NO. : 0370:601:NOG:W:001						REV 0	LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 22 - OF 31
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CLAUSE NO.

PROJECT INFORMATION

ANNEXURE - II

LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM
PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC. NO.:CS-0011-109(1A)-2

SUB SECTION-II-A8
PROJECT INFORMATION
NABINAGAR STPP-I
(3X660MW)

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CLAUSE NO.	PROJECT INFORMATION																																																																																																																								
	ANNEXURE - I SHEET 2 OF 2 जलवायवी सारणी CLIMATOLOGICAL TABLE स्टेशन : देहली STATION : Dehli <table><tr><th>महीना</th><th>सैजन</th><th>पवन</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>सैजन</th></tr><tr><th>महीना</th><th>सैजन</th><th>पवन</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>पवन की दिशा के हिसाब से सैजन का प्रतिशत</th><th>सैजन</th></tr><tr><td>जनवरी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>फरवरी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>मार्च</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>अप्रैल</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>मई</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>जून</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>जुलाई</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>अगस्त</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>सितंबर</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>अक्टूबर</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>नवंबर</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>दिसंबर</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr><tr><td>कुल</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td><td>गर्मी</td></tr></table>	महीना	सैजन	पवन	पवन की दिशा के हिसाब से सैजन का प्रतिशत	पवन की दिशा के हिसाब से सैजन का प्रतिशत	पवन की दिशा के हिसाब से सैजन का प्रतिशत	पवन की दिशा के हिसाब से सैजन का प्रतिशत	सैजन	महीना	सैजन	पवन	पवन की दिशा के हिसाब से सैजन का प्रतिशत	पवन की दिशा के हिसाब से सैजन का प्रतिशत	पवन की दिशा के हिसाब से सैजन का प्रतिशत	पवन की दिशा के हिसाब से सैजन का प्रतिशत	सैजन	जनवरी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	फरवरी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	मार्च	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	अप्रैल	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	मई	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	जून	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	जुलाई	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	अगस्त	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	सितंबर	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	अक्टूबर	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	नवंबर	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	दिसंबर	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	कुल	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी	गर्मी
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CLAUSE NO.	PROJECT INFORMATION						
	TABLE – 1						
	COAL CHARACTERISTICS						
	Sl. No.	Description	Symbol	Design Coal	Worst Coal	Best Coal	Range of Adequacy Coal
	1	2	3	4	5	6	7
	A.	PROXIMATE ANALYSIS (As received basis)					
	1.	Total Moisture	%	15.00	17.00	12.00	11.00-17.00
	2.	Ash	%	45.00	48.00	38.00	36.00-49.00
	3.	Volatile matter	%	18.00	17.00	22.00	23.00-17.00
	4.	Fixed carbon	%	22.00	18.00	28.00	30.00-17.00
	B.	ULTIMATE ANALYSIS (As received basis)					
	1.	Carbon	C%	29.80	25.40	39.00	41.20-24.90
	2.	Hydrogen	H2%	3.00	2.80	3.20	3.30-2.60
	3.	Nitrogen	N2%	0.8	0.70	1.00	1.30-0.50
	4.	Oxygen (By difference)	O2%	5.4	5.10	5.70	6.00-5.00
	5.	Sulphur	S%	0.3	0.50	0.20	0.20-0.60
	6.	Carbonates	CO3%	0.50	0.40	0.60	0.70-0.30
	7.	Phosphorous	P2%	0.2	0.10	0.30	0.30-0.10
	8.	Total Moisture	H2O%	15.00	17.00	12.00	11.00-17.00
	9.	Ash	%	45.00	48.00	38.00	36.00-49.00
	10.	Gross Calorific Value	KCal/Kg	3200	2800	4000	4200 - 2700
	11.	Hard grove index		55	50	60	65-45
	12.	YGP Index		70	80	60	85-55
	C.	ASH ANALYSIS					
	1.	Silica	(SiO2)%	58.65	59.00	58.20	56.9-59.20
	2.	Alumina	(Al2O3)%	28.80	28.00	29.50	27.70-30.00
	3.	Iron Oxide	(Fe2O3)%	5.50	6.00	4.70	4.50-6.50
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CLAUSE NO.	PROJECT INFORMATION							
	Sl. No.	Description	Symbol	Design Coal	Worst Coal	Best Coal	Range of Adequacy Coal	
	1	2	3	4	5	6	7	
	4.	Titania	(TiO2)%	1.80	2.00	1.70	1.50-2.10	
	5.	Phosphoric Anhydride	(P2O5)%	0.70	0.60	0.90	0.40-0.95	
	6.	Lime	(CaO)%	1.50	1.20	1.90	1.00-2.10	
	7.	Magnesia	(MgO)%	1.30	1.50	1.20	1.50-2.10	
	8.	Sulphuric Anhydride	(SO3)%	0.50	0.60	0.40	0.40-0.62	
	9.	Sodium Oxide	(Na2O)%	0.10	0.08	0.30	0.35-0.08	
	10.	Balance Alkalies (By Difference)	%	1.15	1.02	1.2	1.20-0.90	
	D.	ASH FUSION RANGE (Under reducing atmosphere)						
	a)	Initial Deformation Temperature (IDT)	°C	1100	1100	1100	1150-1100	
	b)	Hemispherical temperature	°C	1300	1250	1350	1400-1250	
	c)	Flow temperature	°C	1400	1400	1400	1400-1400	
	LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE			TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2		SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)		PAGE - 26 - OF 31

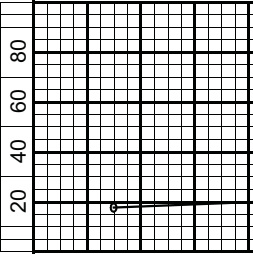
CLAUSE NO.	PROJECT INFORMATION																																																																									
	TABLE – 2A FUEL OIL CHARACTERISTICS <table> <tr> <th>Sl. No.</th><th>Characteristics</th><th>Heavy Furnace Oil grade HV (HFO) IS-1593-1982</th><th>Low Sulphur Heavy Stock (LSHS) IS-11489-1985</th><th>Heavy Petroleum stock (HPS) IS-11489-1985</th></tr> <tr> <td>1.</td><td>Total sulphur content</td><td>4.5% Max.</td><td>1.0% Max.</td><td>4.5% Max.</td></tr> <tr> <td>2.</td><td>Gross calorific value (KCal/kg)</td><td>of the order of 10,000</td><td>of the order of 10,000</td><td>of the order of 10,000</td></tr> <tr> <td>3.</td><td>Flash Point (Min)</td><td>66 deg C</td><td>76 deg C</td><td>66 deg C</td></tr> <tr> <td>4.</td><td>Water content by volume (Max)</td><td>1.0%</td><td>1.0%</td><td>1.0%</td></tr> <tr> <td>5.</td><td>Sediment by weight (Max)</td><td>0.25%</td><td>0.25%</td><td>0.25%</td></tr> <tr> <td>6.</td><td>Asphaltene content by weight (Max.)</td><td>2.5%</td><td>2.5%</td><td>2.5%</td></tr> <tr> <td>7.</td><td>Kinematic viscosity in Centistokes</td><td>370 at 50deg C</td><td>100 at 100deg C</td><td>100 at 100deg C</td></tr> <tr> <td>8.</td><td>Ash Content by weight (Max.)</td><td>0.1%</td><td>0.1%</td><td>0.1%</td></tr> <tr> <td>9.</td><td>Acidity (inorganic)</td><td>Nil</td><td>Nil</td><td>Nil</td></tr> <tr> <td>10.</td><td>Pour Point (Max.)</td><td>57 deg C</td><td>66 deg C</td><td>72 deg C</td></tr> <tr> <td>11.</td><td>Sodium content</td><td>—</td><td>—</td><td>100 ppm</td></tr> <tr> <td>12.</td><td>Vanadium content</td><td>25 ppm</td><td>25ppm</td><td>25 ppm</td></tr> <tr> <td>13.</td><td>Specific heat below pour point (KCal/Kg °C)</td><td></td><td>0.65</td><td></td></tr> </table>				Sl. No.	Characteristics	Heavy Furnace Oil grade HV (HFO) IS-1593-1982	Low Sulphur Heavy Stock (LSHS) IS-11489-1985	Heavy Petroleum stock (HPS) IS-11489-1985	1.	Total sulphur content	4.5% Max.	1.0% Max.	4.5% Max.	2.	Gross calorific value (KCal/kg)	of the order of 10,000	of the order of 10,000	of the order of 10,000	3.	Flash Point (Min)	66 deg C	76 deg C	66 deg C	4.	Water content by volume (Max)	1.0%	1.0%	1.0%	5.	Sediment by weight (Max)	0.25%	0.25%	0.25%	6.	Asphaltene content by weight (Max.)	2.5%	2.5%	2.5%	7.	Kinematic viscosity in Centistokes	370 at 50deg C	100 at 100deg C	100 at 100deg C	8.	Ash Content by weight (Max.)	0.1%	0.1%	0.1%	9.	Acidity (inorganic)	Nil	Nil	Nil	10.	Pour Point (Max.)	57 deg C	66 deg C	72 deg C	11.	Sodium content	—	—	100 ppm	12.	Vanadium content	25 ppm	25ppm	25 ppm	13.	Specific heat below pour point (KCal/Kg °C)		0.65	
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LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 27 - OF 31																																																																						

CLAUSE NO.	PROJECT INFORMATION																										
	TABLE – 2B LIGHT DIESEL OIL CHARACTERISTICS AS PER IS 1460-2000 <table><thead><tr><th>Characteristics</th><th>LDO</th></tr></thead><tbody><tr><td>1. Pour Point (max)</td><td>21 deg.C & 12°C for Summer and Winter respectively</td></tr><tr><td>2. Kinematic viscosity in centistokes at 40 deg.C</td><td>2.5 to 15.7</td></tr><tr><td>3. Sediment percent by mass (max)</td><td>0.10</td></tr><tr><td>4. Total sulphur percent by mass (max)</td><td>1.8</td></tr><tr><td>5. Ash percentage by mass (max)</td><td>0.02</td></tr><tr><td>6. Carbon residue (Rans bottom) percent by pass (max.)</td><td>1.50</td></tr><tr><td>7. Acidity in organic</td><td>Nil</td></tr><tr><td>8. Flash point(Min.) - Pensky Martens</td><td>66 deg.C</td></tr><tr><td>9. Copper strip corrosion for 3 hours at 100°C</td><td>Not worse than No. 2</td></tr><tr><td>10. Water content, % by volume(max)</td><td>0.25</td></tr><tr><td>11. GCV (Kcal/kg)</td><td>10,000</td></tr></tbody></table>			Characteristics	LDO	1. Pour Point (max)	21 deg.C & 12°C for Summer and Winter respectively	2. Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.7	3. Sediment percent by mass (max)	0.10	4. Total sulphur percent by mass (max)	1.8	5. Ash percentage by mass (max)	0.02	6. Carbon residue (Rans bottom) percent by pass (max.)	1.50	7. Acidity in organic	Nil	8. Flash point(Min.) - Pensky Martens	66 deg.C	9. Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2	10. Water content, % by volume(max)	0.25	11. GCV (Kcal/kg)	10,000
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LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 28 - OF 31																								

CLAUSE NO.	PROJECT INFORMATION																																																																													
	Table-3 <table><tr><th>S.No</th><th>Constituent</th><th>As</th><th>mg/l (except pH & turbidity)</th></tr><tr><td>1.</td><td>Calcium</td><td>CaCO₃</td><td>131</td></tr><tr><td>2.</td><td>Magnesium</td><td>CaCO₃</td><td>52</td></tr><tr><td>3.</td><td>Sodium + Potassium</td><td>CaCO₃</td><td>65</td></tr><tr><td>4.</td><td>Total Cations</td><td>CaCO₃</td><td>248</td></tr><tr><td>5.</td><td>Chloride</td><td>CaCO₃</td><td>20</td></tr><tr><td>6.</td><td>Sulphate</td><td>CaCO₃</td><td>93</td></tr><tr><td>7.</td><td>Nitrate</td><td>CaCO₃</td><td>10</td></tr><tr><td>8.</td><td>Alkalinity</td><td>CaCO₃</td><td>125</td></tr><tr><td>9.</td><td>Total Anions</td><td>CaCO₃</td><td>248</td></tr><tr><td>10.</td><td>Iron(total)</td><td>Fe</td><td>0.3</td></tr><tr><td>11.</td><td>Total Silica</td><td>SiO₂</td><td>22</td></tr><tr><td>12.</td><td>pH value</td><td>---</td><td>7.0-8.2</td></tr><tr><td>13.</td><td>Turbidity</td><td>NTU</td><td>10</td></tr></table> Note: Clarified water is used for CW system as make up & the CW system is expected to operate at about 5.0 – 5.5 Cycles of Concentration (COC) with suitable chemical treatment program using acid, scale & corrosion inhibitor dosing. As CW blow down water is tapped from CW system, the water quality of CW blow down shall accordingly be arrived by the bidder. Table-4 ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER <table><tr><th>Sl.No.</th><th>Characteristics</th><th>Value</th></tr><tr><td>1.</td><td>Silica (Max.)</td><td>0.02 ppm as Sio2</td></tr><tr><td>2.</td><td>Iron as Fe</td><td>Nil</td></tr><tr><td>3.</td><td>Total hardness</td><td>Nil</td></tr><tr><td>4.</td><td>pH value</td><td>6.8 -7.2</td></tr><tr><td>5.</td><td>Conductivity</td><td>Not more than 0.1 micro mhos/cm excluding the effects of free CO2</td></tr></table>				S.No	Constituent	As	mg/l (except pH & turbidity)	1.	Calcium	CaCO ₃	131	2.	Magnesium	CaCO ₃	52	3.	Sodium + Potassium	CaCO ₃	65	4.	Total Cations	CaCO ₃	248	5.	Chloride	CaCO ₃	20	6.	Sulphate	CaCO ₃	93	7.	Nitrate	CaCO ₃	10	8.	Alkalinity	CaCO ₃	125	9.	Total Anions	CaCO ₃	248	10.	Iron(total)	Fe	0.3	11.	Total Silica	SiO ₂	22	12.	pH value	---	7.0-8.2	13.	Turbidity	NTU	10	Sl.No.	Characteristics	Value	1.	Silica (Max.)	0.02 ppm as Sio2	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 -7.2	5.	Conductivity	Not more than 0.1 micro mhos/cm excluding the effects of free CO2
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LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 29 - OF 31																																																																										

CLAUSE NO.	PROJECT INFORMATION			
9.00.00	Table-5			
	STEAM GENERATOR DATA			
	1.	Location	Outdoor	
	2.	Operation	Base load	
	3.	Type	Pulverised coal fired	
	4.	Maximum Continuous Rating	2120 Tons/hr.	
	5.	Steam pressure at SH outlet	255 Kg/cm² (a)	
	6.	Steam temperature at SH outlet	568°C	
	7.	Oil for start-up and flame stabilisation	HFO/LSHS/HPS/LDO	
	8.	Fuel oil system sizing	30% of Boiler MCR for Heavy oil/LSHS/HPS (7.5% BMCR for LDO)	
	9.	Pulverised coal size	Minimum 70% through 200 Mesh and 99% thru 50 mesh	
	10.	Type of pulveriser	Vertical spindle mills	
	11.	Type of oil burners	Steam atomised, (Air atomised for LDO)	
12.	No. of air heaters	Two Bisector(2) for the secondary air side & Two Bisector(2) for the primary air side		
13.	No. of ID Fans	Two (both working)		
10.00.00	ESP DATA			
	1.	Location:	Downstream side of Air preheaters	
	2.	Operation:	Base load	
	3.	Type:	Rigid Discharge frame	
	4.	Rapping:	Intermittent	
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2	SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)	PAGE - 30 - OF 31

CLAUSE NO.	PROJECT INFORMATION					
	Table-6					
	List of Drawings placed below in this sub section:					
	Sl.No.	Drawing Description			Drawing No.	
	1.	General Layout Plan			Enclosed	
	2.	Equipment Layout Plan			Enclosed	
	3.	ID system-Elevation & Plan			Enclosed	
	4.	Pipe Cable Trestle Layout			Enclosed	
	5.	Pipe	Cable	Trestle	Enclosed	
		Foundation				
	6.	Chimney foundation details				
		Chimney shell outer diameter at ground level (m)	Chimney foundation outer diameter (m)	Type of foundation	Level of Top of foundation (m)	Level of Bottom of foundation (m)
	Unit #1	32	46.7	Raft supported on piles	RL(+) 120.20	RL(+) 115.95
	Unit #2&3	34.5	51.22	Raft supported on piles	RL(+) 120.20	RL(+) 115.70
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-0011-109(1A)-2		SUB SECTION-II-A8 PROJECT INFORMATION NABINAGAR STPP-I (3X660MW)		
PAGE - 31 - OF 31						

TYPE OF SAMPLES	The Designers' Consortium		SOIL PROFILE	NTPC LTD.	Geotechnical Investigation for New Nabinagar STPP (4x660MW)	COORDINATE		Depth of Boring (m)	DATE	WATER TABLE		LOCATION	SHEET	ANNEXURE											
	DEPTH BELOW NGL (m)	SUB SOIL PROFILE	SOIL DESCRIPTION AND ITS CLASSIFICATION		SPT 'N' VALUES	GRAIN SIZE DISTRIBUTION		ATTERBERGS' LIMIT	DENSITY (gm/cm ³)	NATURAL MOISTURE CONTENTS (%)	SPECIFIC GRAVITY	FREE SWELLING	RELATIVE DENSITY	COHESION C (Kg/cm ²)	SHEAR PARA - METER	CONSOLIDATION PARAMTR.	VOID RATIO e ₀	COMPRESSION INDEX C _c	SWELLING PRESSURE (kg/cm ²)						
UDS SPT	1.0		Dark grey silty clay with kankar of high plasticity (CH)		18	PLOT OF SPT 'N' VALUES Recorded x x x x Corrected o o o o 	6	10	66	18	62	35	27	15	1.85	1.59	16.4	2.68	47		0.65	0	0.69	0.130	0.15
SPT	2.0		Dark grey silty clay with kankar of medium plasticity (CI)		34		5	13	73	9	45	28	17	12											
UDS SPT	3.0																								
SPT	4.0																								
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TYPE OF SAMPLES	The Designers' Consortium	SOIL PROFILE	NTPC LTD.	Geotechnical Investigation for New Nabinagar STPP (4x660MW)	COORDINATE 600N 2510E Elv. 120.213	Depth of Boring (m) 35.0	DATE from 28/6/2009 to 2/7/2009	WATER TABLE (m) NIL			LOCATION BH-23	SHEET 55	ANNEX 'A'																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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TENDER NO PSER:SCT:NBN-C2059:20

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	The Designers' Consortium		SOIL PROFILE	NTPC LTD.	Geotechnical Investigation for New Nabinagar STPP (4x660MW)	COORDINATE 570N 2230E Elev. 120.501		Depth of Boring (m) 25.0	DATE from 4/6/2009 to 12/6/2009	WATER TABLE (m) 13.70		LOCATION BH-24	SHEET 57	ANNEX 'A'															
	TYPE OF SAMPLES	DEPTH BELOW NGL (m)	SUB SOIL PROFILE	SOIL DESCRIPTION AND ITS CLASSIFICATION	SPT 'N' VALUES	PLOT OF SPT 'N' VALUES Recorded x x x x Corrected o o o o		GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SHRINKAGE LIMIT	BULK DENSITY	DRY DENSITY	NATURAL MOISTURE CONTENTS (%)	SPECIFIC GRAVITY	FREE SWELLING	RELATIVE DENSITY	COHESION C (kg/cm ²)	FRICTION ANGLE ϕ	SHEAR PARA - METER	CONSOLI- DATION PARAMTR.	VOID RATIO e_0	COMPRESSION INDEX C_c	SWELLING PRESSURE (kg/cm ²)	
UDS	1.0	Dark grey silty clay with kankar of high plasticity (CH)		Dark grey silty clay with kankar of high plasticity (CH)	19		6	13	66	15	63	34	29	14	1.84	1.59	15.7	2.68	45		0.65	0			0.69	0.135	0.15		
SPT	2.0				25																								
SPT	3.0				30																								
SPT	4.0				31																								
SPT	5.0	Dark grey silty clay with kankar of medium plasticity (CI)		Dark grey silty clay with kankar of medium plasticity (CI)	34																								
UDS	6.0				36																								
SPT	7.0				38																								
SPT	8.0				40																								
SPT	9.0				42																								
UDS	10.0				44																								
SPT	11.0																												
SPT	12.0																												
UDS	13.0																												
SPT	14.0																												
SPT	15.0																												

TYPE OF SAMPLES	The Designers' Consortium		SOIL PROFILE	NTPC LTD.	Geotechnical Investigation for New Nabinagar STPP (4x660MW)		COORDINATE 570N 2230E Elev. 120.501		Depth of Boring (m) 25.0	DATE from 4/6/2009 to 12/6/2009	WATER TABLE (m) 13.70	LOCATION BH-24	SHEET 58	ANNEX 'A'															
	DEPTH BELOW NGL (m)	SUB SOIL PROFILE	SOIL DESCRIPTION AND ITS CLASSIFICATION		SPT 'N' VALUES	PLOT OF SPT 'N' VALUES Recorded x x x o Corrected o o o o		GRAIN SIZE DISTRIBUTION		ATTERBERGS' LIMIT		DENSITY (gm/cm ³)	NATURAL MOISTURE CONTENTS (%)	SPECIFIC GRAVITY	FREE SWELLING	RELATIVE DENSITY	SHEAR PARA - METER		CONSOLIDATION PARAMTR.	SWELLING PRESSURE (kg/cm ²)									
UDS	16.0		Dark grey silty clay with kankar of medium plasticity (CI)		38						BULK DENSITY	1.89	17.4	2.66			0.00	32	0.65										
SPT	17.0				42																								
SPT	18.0				47																								
UDS	19.0				52/28																								
SPT	20.0				55/28																								
SPT	21.0		Greyish poorly graded fine silty sand (SP-SM)		56/29											BULK DENSITY													
UDS	22.0																												
SPT	23.0																												
UDS	24.0																												
SPT	25.0																												

TYPE OF SAMPLES	DEPTH BELOW NGL (m)	SUB SOIL PROFILE	SOIL DESIGNATION AND ITS CLASSIFICATION	SPT 'N' VALUES	PLOT OF SPT 'N' VALUES		GRAIN SIZE DISTRIBUTION	ATTERBERGS' LIMIT				DENSITY (gm/cm ³)		NATURAL MOISTURE CONTENTS (%)	SPECIFIC GRAVITY	FREE SWELLING	RELATIVE DENSITY	SHEAR PARA - METER		VOID RATIO e ₀	COMPRESSION INDEX C _c	SWELLING PRESSURE (kg/cm ²)	TENDER NO PSER:SCT:NBN-C2059-20																			
					Recorded	Corrected		GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)	LIQUID LIMIT	PLASTIC LIMIT					PLASTIC INDEX	SHRINKAGE LIMIT					BULK DENSITY	DRY DENSITY																	
	UDS	3.5	Dark grey silty clay with kankar of high plasticity (CH)	22																																						
	SPT			24																																						
	SPT			30																																						
	SPT			33																																						
	SPT			36																																						
	UDS		Dark grey silty clay with kankar of medium plasticity (CI)																																							
	SPT																																									
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TYPE OF SAMPLES	DEPTH BELOW NGL (m)	SUB SOIL PROFILE	SOIL DESCRIPTION AND ITS CLASSIFICATION	SPT 'N' VALUES	PLOT OF SPT 'N' VALUES Recorded x x x x Corrected o o o o	GRAIN SIZE DISTRIBUTION	ATTERBERGS' LIMIT	DENSITY (gm/cm ³)	NATURAL MOISTURE CONTENTS (%)	SPECIFIC GRAVITY	FREE SWELLING	RELATIVE DENSITY	SHEAR PARA-METER			VOID RATIO e ₀	COMPRESSION INDEX C _p	SWELLING PRESSURE (kg/cm ²)	ANNEX 'A'	SHEET 60	LOCATION BH-25	WATER TABLE (m) NIL	DATE from 14/7/2009 to 16/7/2009	Depth of Boring (m) 30.0	COORDINATE 62°N 1980E Eiv. 120.502	Geotechnical Investigation for New Nabinagar STPP (4x660MW)	NTPC LTD.	SOIL PROFILE	The Designers' Consortium	TENDER NO PSER:SCT:NBN-C205920
													COHESION C (kg/cm ²)	FRICITION ANGLE φ	CONSOLIDATION PARAMTR.															
UDS	16.0	Dark grey silty clay with kankar of medium plasticity (CI)		39		7	15	73	5	38	23	15	9	1.85	1.58	17.1	2.66	34	0.25	17	0.68	0.118	20	61	TENDER NO PSER:SCT:NBN-C205920					
SPT	17.0			41																										
SPT	18.0			45/23																										
UDS	19.0			47/23																										
SPT	20.0			49/25																										
SPT	21.0	Brownish poorly graded medium to coarse sand (SP)		54/26		0	95	5	0	NON-PLASTIC	1.89	1.61	17.4	2.65	0.00	33														
SPT	22.0																													
SPT	23.0																													
UDS	24.0																													
SPT	25.0																													
SPT	26.0																													
SPT	27.0																													
SPT	28.0																													
UDS	29.0																													
SPT	30.0																													

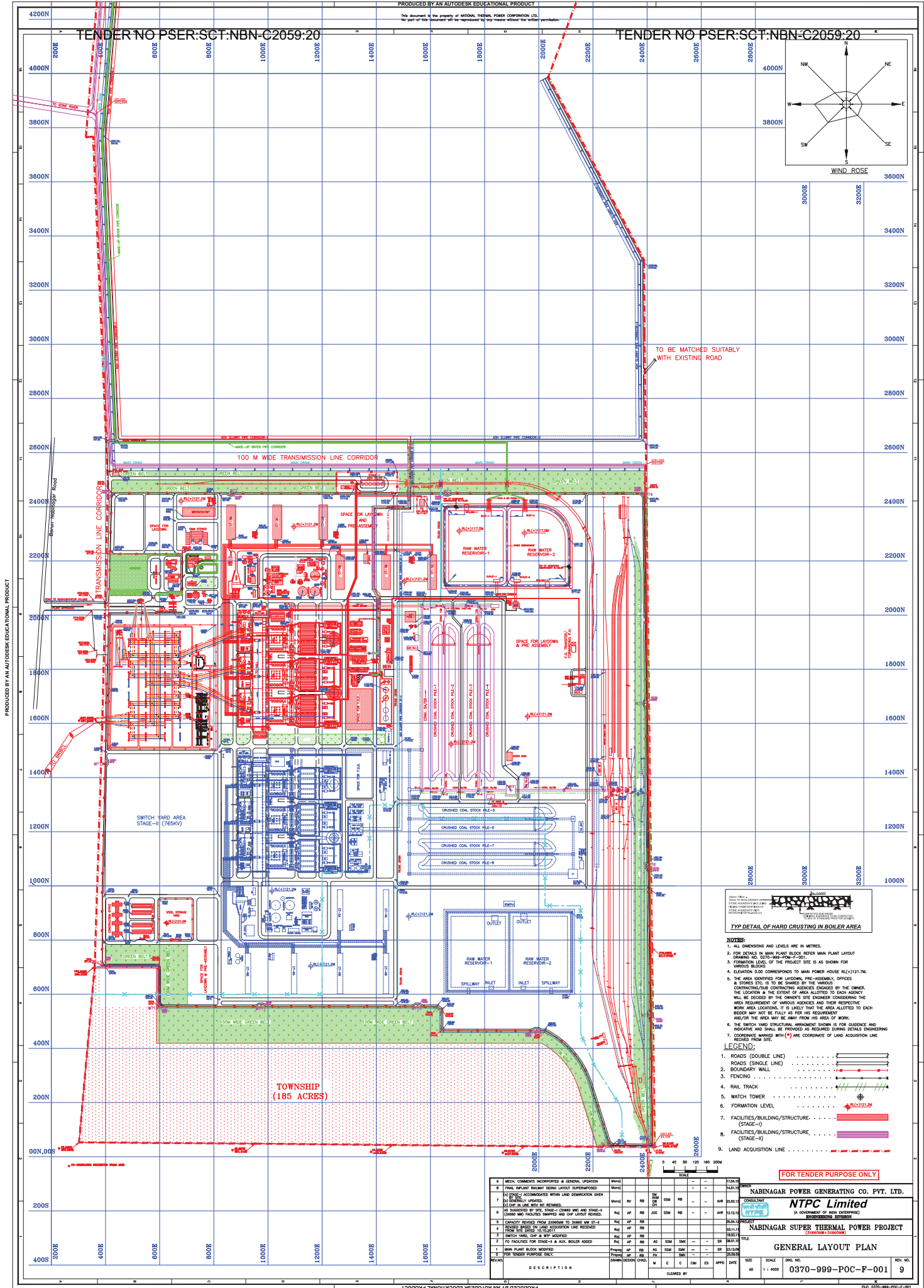
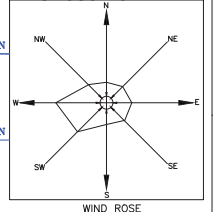
TYPE OF SAMPLES	DEPTH BELOW NGL (m)	SUB SOIL PROFILE	SOIL PROFILE	NTPC LTD.	Geotechnical Investigation for New Nabinagar STPP (4x660MW)	COORDINATE 850N 1965E Elev. 120.246	Depth of Boring (m) 30.0	DATE from 30/6/2009 to 5/7/2009	WATER TABLE			LOCATION BH-26	SHEET 61	ANNEX 'A'	TENDER NO								
									TABLE	(m)	NIL					PSER:SCT:NBN-C							
TYPE OF SAMPLES	DEPTH BELOW NGL (m)	SUB SOIL PROFILE	SOIL DESCRIPTION AND ITS CLASSIFICATION	SPT 'N' VALUES	GRAVEL (%)	GRAIN SIZE DISTRIBUTION				ATTERBERGS' LIMIT	DENSITY (gm/cm ³)	NATURAL MOISTURE CONTENTS (%)	SPECIFIC GRAVITY	FREE SWELLING(%)	RELATIVE DENSITY	COHESION C (kg/cm ²)	FRICTION ANGLE ϕ	VOID RATIO e_0	COMPRESSION INDEX C_c	SWELLING PRESSURE (kg/cm ²)	PSER:SCT:NBN-C		
						SAND (%)	SILT (%)	CLAY (%)	LIQUID LIMIT													PLASTIC LIMIT	PLASTIC INDEX
UDS	1.0	Dark grey silty clay with kankar of high plasticity (CH)		18	3	15	68	14	58	33	25	13	1.80	1.58	13.9	0.60	0	0.69	0.128	0.2	NO PSER:SCT:NBN-C		
SPT	2.0																						
SPT	3.0																						
SPT	4.0																						
SPT	5.0	Dark grey silty clay with kankar of medium plasticity (CI)		27	5	17	71	7	41	22	19	9			45								
UDS	6.0																						
SPT	7.0																						
SPT	8.0			31																			
SPT	9.0																						
UDS	10.0																						
SPT	11.0			33																			
SPT	12.0																						
UDS	13.0																						
SPT	14.0			35																			
SPT	15.0																						

TENDER NO PSER:SCT:NBN-C2059:20

TENDER NO PSER:SCT:NBH-C2059:20

TENDER NO PSER:SCT:NBH-C2059:20

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- NOTES:**
1. ALL DIMENSIONS AND LEVELS ARE IN METRES.
 2. FOR DETAILS IN MAIN PLANT BLOCK REFER MAIN PLANT LAYOUT DRAWING NO. 0370-999-POC-F-001.
 3. FORMATION LEVEL OF THE PROJECT SITE IS AS SHOWN FOR VARIOUS BLOCKS.
 4. ELEVATION 0.00 CORRESPONDS TO MAIN POWER HOUSE RL(+121.7M).
 5. THE AREA IDENTIFIED FOR LAYDOWN, PRE-ASSEMBLY, OFFICES & STORES ETC. IS TO BE SHARED BY THE VARIOUS CONTRACTORS/AGENCIES. THE CONTRACTORS/AGENCIES SHALL BE RESPONSIBLE FOR THE LOCATION AS TO THE EXTENT OF AREA ALLOTTED TO EACH AGENCY. THE CONTRACTORS/AGENCIES SHALL BE RESPONSIBLE FOR THE AREA REQUIREMENT OF VARIOUS AGENCIES AND THEIR RESPECTIVE WORK AREA LOCATIONS. IT IS UNDERSTOOD THAT THE AREA ALLOTTED TO EACH AGENCY MAY NOT BE FULLY AS PER HIS REQUIREMENT AND/OR THE AREA MAY BE ABSTAIN FROM HIS AREA OF WORK.
 6. THE SWITCH YARD STRUCTURAL ARRANGEMENT SHOWN IS FOR GUIDANCE AND INDICATIVE AND SHALL BE PROVIDED AS REQUIRED DURING DETAILED ENGINEERING DESIGN.
 7. COORDINATE MARKING WITH (+) ARE COORDINATE OF LAND ACQUISITION LINE DERIVED FROM SITE.

- LEGEND:**
1. ROADS (DOUBLE LINE)
 2. ROADS (SINGLE LINE)
 3. BOUNDARY WALL
 4. FENCING
 5. RAIL TRACK
 6. WATCH TOWER
 7. FORMATION LEVEL
 8. FACILITIES/BUILDING/STRUCTURE (STAGE-I)
 9. FACILITIES/BUILDING/STRUCTURE (STAGE-II)
 10. LAND ACQUISITION LINE

(FOR TENDER PURPOSE ONLY)

FOR TENDER PURPOSE ONLY									
NABINAGAR POWER GENERATING CO. PVT. LTD.									
NTPC Limited									
(A GOVERNMENT OF INDIA ENTERPRISE)									
NABINAGAR SUPER THERMAL POWER PROJECT									
(1300MW X 2)									
GENERAL LAYOUT PLAN									
REV. NO.									
0370-999-POC-F-001									
DATE									
11/05/2005									
SCALE									
1:1000									
SHEET NO.									
0370-999-POC-F-001									
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SUB-SECTION-III-D

CIVIL WORKS

**LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-0011-109(1A)-2**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.00.00	SCOPE OF CIVIL WORKS			
1.01.01	Scope of Bidder shall include all Civil, Structural, Architectural works including underground facilities like drainage, sewerage, trenches, earthing mat/ grounding, of all the facilities associated with complete Flue gas desulfurization (FGD) system, Zero Liquid Discharge (ZLD) system & Chimney as specified elsewhere in the technical specification.			
1.02.00	The work to be performed under this specification consists of providing all labour, materials, construction equipment, tools and plant, scaffolding, supplies, transportation, all incidental items not shown or specified, but reasonably implied or necessary for successful completion of the work including Bidder's supervision and in strict accordance with the drawings and specifications. The nature of work shall generally involve earthwork in excavation & deep underground excavation, extensive de-watering, shoring and strutting, sheet piling, back filling around completed structures and plinth protection, paving , disposal of surplus excavated materials, piling, concreting including reinforcement and form work, brick work, fabrication and erection of structural / miscellaneous steel works, inserts, architectural items & finishes such as plastering, painting, flooring, doors, windows & ventilators, glass and glazing, rolling shutters etc., permanently colour coated profiled steel sheeting, anchor bolts, R. C. C. trenches with covers, laying and testing of water pipes, sanitation, water supply, drainage, damp proofing, water proofing and other ancillary items.			
1.03.00	The work shall have to be carried out both below and above ground level and shall be involving, basements, equipment foundations, grounding, slabs, beams, columns, footings, rafts, walls, steel frames, brick walls, stairs, trenches, pits, access roads, culverts, trestles, finishes, false ceiling and complete architectural works, etc. The works covered under the scope of the bidder have to be executed in an operating / under construction power station. The bidder shall take all necessary precautions to protect the entire existing equipments, structures, facilities and buildings etc. from damage. In case any damage occurs due to activities of the bidder on account of negligence, ignorance, accidental or any other reason what so ever, the damage shall be made - good by the bidder at his own cost to the satisfaction of the Owner. The bidder shall take all necessary safety measures to avoid any harm, injury to his workers/staff from the equipment / facilities of the power station.			
1.04.00	If during the execution of works it is found that there is interference with the existing facilities / structures, the bidder shall revise his design / detailed drawings to clear the interference and shall provide all necessary measures for the safety of existing structures. In case the details shown in tender drawings are found to be different from actual details at site, bidder shall revise his design/ detailed drawings to suit the constraints at site. No claim in terms of cost or relaxation in time shall be entertained for any redesign, rework and for safety measures provided. If at any stage of work, any dismantling or modification or relocation of any existing facility is required to be done to complete the work in bidder's scope and which has been agreed by the Employer, the same shall be done by the bidder at no extra cost or time implication to the Employer. All such changes will be as per drawings and work plan approved by the employer.			
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOCUMENT NO.: CS-0011-109(1A)2	SUB-SECTION-III-D CIVIL WORKS	PAGE 1 OF 4	

TENDER NO FSR.SCT.NBN-C2039.20		TENDER NO FSR.SCT.NBN-C2039.20	
CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
1.05.00	Analysis, design and preparation of construction drawings for all structure/facilities under the scope of this package and getting the same approved from the owner.		
1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.		
2.00.00	CONSTRUCTION FACILITIES The following are also in the Bidder's scope of work: 1. Providing drinking and service water for Bidder's labour, staff and other personnel working for Bidder at the work site and in his staff/ labour colony. He shall install necessary bore wells with associated pumping or water tankers and treatment facilities to supply quality water as per standards. 2. Developing temporary staff colony and labour colony along with fencing etc. Land if required shall be arranged by the Bidder himself. However space required for bidder's office, storage, pre assembly and fabrication areas shall be provided by owner free of charge within the plant premises. The area to be allocated to the Bidder shall be discussed & finalized with the bidder after the award, keeping in view the availability of free space & similar requirement of other agencies. 3. Providing all arrangements for distribution of construction power at various locations as per his requirements from the supply point of Owner. 4. Providing all arrangements for the supply of construction water including bore-wells, water tankers etc. 5. Providing temporary construction office, construction stores (open / covered), workshops, material / field testing laboratory, any other temporary buildings 6. Providing all construction equipment, labour and materials. The Bidder shall provide all the tools and tackles required for the work. 7. Development of the pre-assembly and storage yard with fencing, drainage, internal roads, boulder soling, etc. 8. Approach road to project site is available. Further, Owner intends to construct the roads as per the layout shown in the General Layout plan in a progressive manner. Some of these roads may not be available to the bidder for his use. Similarly the drainage network for the plant site being constructed by the owner may not be available to full extent. The bidder shall plan his work within the plant area considering the above constraints of roads and drains. Access roads to his work sites, offices, stores, preassembly / fabrication yard, etc. as required for providing approach/access for men, materials, equipment, cranes, trailer, construction/erection activities etc., what so ever are required by the bidder, shall be constructed and maintained by the bidder. Bidder shall provide permanent access to all facilities/ structures from the nearby existing roads of the owner. Roads shall be in		
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOCUMENT NO.: CS-0011-109(1A)2	SUB-SECTION-III-D CIVIL WORKS PAGE 2 OF 4

TENDER NO FSER.SCT.NBN-C2039.20		TENDER NO FSER.SCT.NBN-C2039.20	
CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		एनटीपीसी NTPC
	concrete (M-35 grade) as per IRC standards, with minimum thickness of pavement (PQC) as 250mm. Width of all such roads shall be 7.5M concrete pavement. 9. Area lighting at the construction / erection site, pre-assembly and storage yard, office areas and labour / staff colony. 10. Providing all necessary fire-fighting devices / equipment / fire tender etc. required during the project execution stage. He shall maintain all such equipment / devices in proper working conditions throughout the period of work. 11. Providing first aid facilities at the construction / erection sites, workshops, laboratories, pre-assembly and storage yard and other places of work as per the requirement. 12. The Bidder shall arrange skilled / semiskilled / unskilled manpower from local source(s) as far as available in this country. He shall also arrange supervisory staff for quality execution of all works in his scope. 13. Bidder's office, store, workshop, laboratory or any other temporary buildings: The Bidder shall adopt pre-engineered/ pre-fabricated constructions made of steel with single / double skin, insulated for un-insulated roof and wall coverings (fabricated out of permanently color coated metal sheets) for his site office, covered store workshop, laboratory or any other temporary buildings. 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. The above requirements shall be applicable to his sub-vendors also and bidder shall be responsible for enforcing the same on his sub-vendors. Any other type of construction if proposed by the bidder shall be subject to approval of the owner. However, such construction shall be based on proper design and shall have aesthetic look. 14. Use of ash and ash based products: In line with Gazette Notification on Ash Utilization issued by MOEF and its amendment thereafter, Bidder shall use ash and ash based products in construction of his offices, stores, staff quarters and labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products along with each bill. The above requirements shall be applicable to his sub-vendors also and Bidder shall be responsible for enforcing the same on his sub-vendors. 15. Repair & Maintenance Facilities by the Bidder: Bidder shall establish/set up at site suitable repair facilities for construction plant, equipment and machinery (like cranes, hydra, forklifts, welding equipments, etc.) He will also make arrangements/tie up with manufacturers/ suppliers of such construction plant, equipment & machinery, for periodic overhaul/maintenance and for major breakdown, if any. He shall also keep		
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOCUMENT NO.: CS-0011-109(1A)2	SUB-SECTION-III-D CIVIL WORKS PAGE 3 OF 4

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
	adequate stock of spares at site for various construction 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.		
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SUB-SECTION-IV-D

CIVIL WORKS

**LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-0011-109(1A)-2**



CLAUSE NO.	TECHNICAL REQUIREMENTS
1.00.00	GENERAL
1.01.00	This section of the bidding document deals mainly with the technical specification for the design and preparation of detailed drawings, getting the design and drawings approved by the Employer, fabrication, erection and construction of the necessary civil, structural and architectural works associated with the FGD package for Lot-1A. The work shall have to be carried out both below and above ground level and shall be involving, basements, equipment foundations, slabs, beams, columns, footings, rafts, walls, steel frames, brick walls, stairs, trenches, pits, access roads, culverts, trestles, silos, sumps, Limestone storage hopper & shed, Crusher House, Transfer points, Conveyor Galleries, Tunnels, Gypsum storage shed, Chimney, Gypsum dewatering building, Ball Mill building, FGD control room building, Tank Foundations, absorber tower foundation, transformer foundation, MCC Building, finishes, complete architectural aspects, drainage, sanitation, water supply (from terminal points to various buildings/facilities) and all other civil, structural and architectural works associated with the complete FGD package.
1.02.00	The specifications are intended for the general description of the work, quality and workmanship. The specifications are not, however, intended to cover minutest details and the work shall be executed according to the relevant latest Indian Standard Codes / I. R. S. / I. R. C. specifications. In absence of the above, the work shall be executed according to the best prevailing local Public Works Department practices or to the recommendations of relevant American and British Standards or to the instructions of the Engineer. Some of the relevant I. S. Codes to be followed is mentioned in the Technical Specifications. The Contractor is expected to get clarified on any doubts about the specifications, etc. before bidding, in writing with the Employer in respect of interpretation of any portions of this document.
1.03.00	Bidder or his agencies engaged as detailer for fabrication drawings should have the experience of detailing for power plant structures or steel plant or Industrial structures like Petro/ Chemical/ Refinery/ Cement/FGD Plant/Coal Handling Plant/Ash Handling Plant etc. The designer responsible for preparation of scope drawings shall review and approve the fabrication drawings prepared by the detailer before releasing them for fabrication.
~~2.00.00~~	~~Sub QR for Civil Works:~~ CLOUSE DELETED
~~2.01.00~~	~~Bidder or its agency should have in past executed civil and structural works for 500 MW or higher capacity coal based/Lignite based power plant including earthwork in filling involving mechanical compaction and cutting in hard rock, foundations, Bulk material handling plant involving underground storage hopper and underground tunnels.~~
~~2.02.00~~	~~Bidder can engage more than one agency, in case the Bidder itself is not able to meet the requirement at 2.01.00. The agency being engaged for a particular work should have in the past executed such works of 500 MW or higher capacity plant.~~
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CLAUSE NO.	TECHNICAL REQUIREMENTS
~~2.03.00~~	~~For Chimney, Bidder or its agency should have in the past built at least one (1) reinforced concrete chimney of minimum 100m height.~~
~~2.04.00~~	~~In case Bidder or its agency do not meet the requirements at 2.01.00 and the Bidder proposes to engage agency (ies) for civil & structural works on work volume basis (except for Chimney), Bidder or its agency (ies) should have executed such works in the past and the annual rate of execution in the reference works should not be less than eighty percent (80%) of the asking rate of such works, (structural steel fabrication & erection, RCC, earthwork in filling involving mechanical compaction and cutting in hard rock, RCC in underground storage hopper and underground tunnels) for which it is being engaged.~~ ~~Successful Bidder shall finalize the agency (ies) for each work in consultation with Engineer in charge at site before engaging them.~~
~~2.05.00~~	~~Design agency for Civil & Steel Structural Works:~~ ~~Bidder or its agency (ies) should have carried out the design and detailed engineering of following works:~~ ~~(i) Civil & Structural works associated with at least one bulk material handling plant for 500 MW or higher capacity coal based/Lignite based power plant.~~ ~~(ii) For Chimney, Bidder or its design agency (ies) should have carried out design & detailed engineering of at least one reinforced concrete chimney with steel flues, of minimum 100m height.~~ ~~(iii) Machine foundations such as Mill foundations/ Block foundations.~~
~~2.06.00~~	~~Bidder can engage more than one agency (of repute), in case the Bidder itself is not able to meet the requirement at 2.05.00.~~ ~~The design agency (ies) proposed by the Bidder shall be subject to Employer's approval.~~
3.00.00	Work Description
~~3.01.00~~	~~Truck Hopper, Limestone Storage hopper and Underground Tunnel~~ ~~Truck Hopper shall consist of underground portion, which shall be of R. C. C. with structural steel shed covered with permanently Colour coated profiled steel sheets.~~ ~~Limestone storage hopper shall be of RCC with structural steel shed covered with permanently Colour coated profiled steel sheets.~~ ~~The structural arrangement to be adopted for the design and construction of Limestone Storage hopper shall essentially consist of R. C. C. frames spaced at approx. 3.0M centers with R. C. C. wall panels on the sides and R. C. C. raft at the bottom, fixed to the frames. Minimum thickness of R. C. C. raft at bottom shall be 600~~
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	mm. Minimum thickness of RCC side walls shall be 600 mm at bottom and 300 mm at top. The vertical and inclined portion of hopper shall be provided with 50 mm thick guniting (shotcreting). Details of shotcreting have been given elsewhere in this specification. Expansion joints shall be provided at a maximum distance of 40m. 600 mm wide water stop fabricated with 22G copper plate with bitumen board fillers and polysulphide sealing compound as specified elsewhere shall be used as expansion joint material. Floor shall be provided with cross slope not flatter than 1 in 50 towards side drains. Side drains shall be sloped towards sump where sump pumps as specified elsewhere, shall be provided. The slope of side drains shall not be flatter than 1 in 400. Side drains and sump shall have removable type steel grating cover. Water proofing / Damp proofing of under ground Truck hopper, Limestone Storage hopper, tunnels and underground (i. e. basement) portion of transfer houses shall be done by providing the following treatments: Chemical injection grouting for inner faces (details as specified elsewhere). Polymer modified cementitious coating on earth side face as per the following : (1) On the outer surface of walls, frames and roof slabs coming in contact with earth, polymer modified cementitious coating in two layers as specified and as per manufacturer's specifications shall be provided directly on the concrete surface. (2) 50 mm thick P. C. C. (1 : 2 : 4 with 10 mm nominal size stone aggregates) shall be provided under the raft i.e. over the lean concrete, followed by polymer modified cementitious coating in two layers (slurry mix application) as per manufacturer's specification. 50 mm thick P. C. C (1 : 2 : 4) with 10 mm nominal size stone aggregates shall then be laid over the polymer modified cementitious coating before laying the raft. Truck hopper and its gratings shall be designed for movement of front end loader/ bulldozer over them. Bull dozer weight shall be considered as about 35T. The gratings shall be built of min. 200x28mm thick flats in main direction and min.100mm x 20mm thick in secondary direction. No painting/galvanization shall be provided in gratings. However, two coats of Red oxide Primer to be provided immediately after fabrication. Plinth protection along with drains shall be provided along the Hopper complex. However, 5m wide paving shall also be provided around machinery hatches. Earth pressure to be considered for design shall be due to earth pressure at rest (Ko) condition only. Earth pressure due to surcharge intensity of Uniformly Distributed Load (U. D. L) of intensity 2 T / Sq. M. shall be considered in the design. A minimum safety factor of 1.2 against uplift due to ground water shall be ensured during execution and after execution, considering dead weight of the structure to be		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.02.00	0.9 times only, ground water table to be taken at adjoining formation level and soil wedge angle of not more than 15 degrees. Also, FOS against uplift, to be taken as 1.0, considering the dead wt. of structure and soil resting on side projections if any in the vertical plane. Inclined wedge action of soil shall not be considered in this case. Wherever, slope of tunnel exceeds 10°, R. C. C. steps shall be provided for the entire width of each walkway.		
	Overhead / Ground Conveyor Galleries and Trestles		
	Overhead conveyors shall be located in a suitably enclosed gallery of structural steel. The overhead gallery shall consist of two vertical latticed girders having rigid jointed portal frame at both ends. Cross beams at floor level supporting conveyor stringer beams shall be made of single rolled steel beam or single channel section (ISMB or ISMC) or plate girder. Horizontal bracings are to be provided at top & bottom plan of the gallery (latticed girders shall be braced together in plan at the top and bottom). Common end portal frame shall not be used for adjacent conveyor spans. Roof truss shall be provided at upper node points of latticed girders to form an enclosure. Contractor can also use tubular steel sections for roof truss only of conveyor galleries. The tubular steel section shall be of circular/rectangular/square shape. The circular steel tube shall conform to IS 1161 and rectangular/square steel sections shall conform to IS 4923. The steel structures using tubular sections shall be designed and fabricated as per IS 806 – “Code of Practice for use of steel tubes in general building construction.” and EN 1993-1-8:2005. The maximum span of overhead gallery shall be limited to 25 meters unless higher span is required due to site conditions, which shall be subject to approval of the Engineer. The gallery should as far as possible be erected as a box section keeping all the vertical and horizontal bracing tied in proper position. The gallery should be checked for all erection stresses that are likely to develop during handling and erection and if required, temporary strengthening of gallery members during erection shall be made.		
	Seal plates under the conveyor galleries shall be provided in such a way that complete gallery bottom shall form a leak proof floor.		
	The ground conveyors shall be located in suitably enclosed gallery of structural steel consisting of rigid portal frames spaced at regular intervals and suitably braced. Plinth protection along with drains shall be routed along the ground conveyors.		
For double stream conveyor gallery, two side and one central walkway of width 800 mm and 1100 mm respectively shall be provided. The width of two side walkways for single stream conveyor gallery shall be 800 mm and 1100 mm respectively. Both sides of central and side walkways shall be provided with pipe handrails all along the conveyor gallery. Hand railing should not be supported on conveyor supporting stringers. The walkways shall be chequered plate construction with anti - skid arrangement. The anti - skid arrangement will consist of welding of 10 mm square steel bars at a maximum spacing of 500 mm along the length of the gallery. Where the slope of walkway is more than 10°, chequered plate steps with nosing and toe guard shall be provided. The floor of conveyor gallery all along the gallery length, shall be provided with minimum 12 gauge thick seal plates and other drainage arrangements as specified elsewhere			
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	Conveyor gallery shall have permanently colour coated steel sheet covers on roof and both sides. However in roof, a panel of minimum 1.5 m x 1.5 m area at about 6.0 m center shall be provided with translucent sheets of polycarbonate material for natural lighting. A continuous slit opening of 500 mm shall be provided on both sides just below the roof sheeting. Adequate provision of windows shall be kept on both sides of conveyor gallery as appended in Mechanical Section (Belt conveyor system). Windows shall be provided with wire mesh as specified elsewhere in this specification. Cross - over with chequered plate platform and ladder for crossing over the conveyors shall be provided at approximately every 100 M intervals of conveyor. Crossover shall preferably be located over four-legged rigid trestle location. For railway tracks passing below overhead conveyor gallery and along conveyors, the railway clearances both underground as well as over ground shall have to be adhered to for design, execution and erection of foundations, trestles, galleries etc., so that movement of locomotives and wagons is not hampered in any way during execution and afterwards. However at the location where the overhead conveyor gallery crosses road / rail line, minimum clearance of 8.0m above the road crest / rail top shall be provided. For calculation of material load on moving conveyor, a multiplication factor 1.6 shall be used to take care of inertia force, casual over burden and impact factor etc. Thus material load per unit length of each moving conveyor shall be $1.6 \times \frac{\text{Rated capacity of conveyor system}}{\text{Conveyor Belt Speed}} \times F$ Where, F = 1700/1400 for lime & 1250/900 for gypsum It should be noted that for structural design, unit weight of lime shall be assumed as 1700 Kgs. / Cu. M. instead of 1400 Kgs. / Cu. M., unit weight of gypsum shall be assumed as 1250 Kgs. / Cu. M. instead of 900 Kgs. / Cu. M. considered for system sizing purpose. Conveyor Gallery structure shall be designed considering both conveyors operating simultaneously. Conveyor gallery and supporting trestles located between transfer houses / buildings shall be arranged in any one of the following ways. a) All gallery supporting trestles shall be four legged type only. One end of each gallery span shall be hinged to the supporting trestle and the other end shall be slide type. Slide type support shall be with P. T. F. E. bearings to allow both rotation & longitudinal movements.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.03.00	b) In between transfer houses / buildings, four legged trestles shall be placed at a maximum interval of 90 metres. The arrangement shall be such so as to ensure that force in the longitudinal direction (i. e. along the conveyor length) of conveyor gallery of length not more than 90 m is transferred to any four legged trestle. In the space between each successive four legged trestles, two legged trestles shall be provided at regular intervals. The end supports resting on the four-legged trestle can have either ends hinged or one hinge and the other on slide type depending on the arrangements. Slide type support shall be with P. T. F. E. bearings to allow both rotation & longitudinal movements.			
	End of conveyor gallery which will be supported over transfer house, shall be so detailed that only vertical reaction is transferred from conveyor gallery and no horizontal force in longitudinal direction is transferred from conveyor gallery to transfer house structure and vice - versa.			
	For trestles and trestle foundations for conveyor galleries located adjacent to existing structures, over ground and under ground facilities, location and details of these trestles and foundations shall have to be decided such that there is no interference both underground as well as over ground with existing structures and facilities. Trestle columns / ground conveyor portal column base shall be kept 300 mm higher than the existing ground level.			
	Transfer Houses			
	The over ground portion of the transfer house shall be framed structure of structural steel work with permanently colour coated profiled steel sheet side cladding (from lowest working floor level till top) and R. C. C. floors comprising of RCC slab over profiled metal deck sheets (to be used as permanent shuttering) over structural beams. Shear anchor studs shall be provided through metal deck at regular interval on all top flange/flange plate of structural beams. However, the lower portion of side cladding, at ground, for a minimum height of 0.9 m above the finished floor level shall be one brick thick wall plastered on both side. In some areas like MCC floors etc., one brick thick wall cladding shall be provided. Brick wall cladding shall be supported on encased wall beams and suitably anchored to adjoining columns and beams. Contractor shall have option to use tubular steel sections for roof truss only. Vertical bracings shall be provided only on four sides along the periphery. Grade slab with 0.9m height one brick thick wall plastered on both side at periphery shall be provided for all transfer houses.			
	Adequate steel doors and windows for proper natural lighting and ventilation shall be provided. In addition to steel windows, panels of suitable size to suit the architectural treatment and made of translucent sheets of polycarbonate material shall also be provided on the side cladding for natural lighting.			
	The roof of Transfer points shall be provided with pre-fabricated insulated metal sandwich panels. Composition of Insulated Metal Sandwich Panels shall be as described elsewhere in the Technical Specification. Adequate slope shall be provided for quick drainage of rain water.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
3.04.00	Crusher House The crusher house shall be framed structure of structural steel work with permanently colour coated profiled steel sheet side cladding. However, panels of suitable size to suit the architectural treatment and made of translucent sheets of polycarbonate material shall also be provided on the side cladding for natural lighting. The lower portion of side cladding, at ground, for a height of minimum 0.9m above the finished floor level shall be of one brick thick wall plastered on both faces. Floors shall be of R. C. C. slab over profiled metal deck sheets (to be used as permanent shuttering) over structural beams. Shear anchor studs shall be provided through metal deck at regular interval on all top flange/flange plate of structural beams. Within this building cubicles are to be provided for resting room of operators and these shall be constructed with one brick thick brickwork having both sides plastered and roof slab. Adequate steel doors and windows for natural lighting and ventilation shall be provided. Contractor shall have option to use tubular steel sections for roof truss only . Vertical bracings shall be provided only on four sides along the periphery. The roof of Crusher house shall be provided with pre-fabricated insulated metal sandwich panels. Composition of Insulated Metal Sandwich Panels shall be as described elsewhere in the Technical Specification. Adequate slope shall be provided for quick drainage of rain water. Crushers shall be supported on R. C. C. deck, which in turn will rest on suitable vibration isolation system consisting of springs and dampers. This R. C. C. deck shall be isolated from the floor. However, the vibration isolation system consisting of springs and dampers may rest on main building framework. Detailed specification of vibration isolation system including the unbalanced force, frequency and amplitude criteria and other design requirements are appended elsewhere in this specification				
3.05.00	Control building, M. C. C. Buildings These shall be steel or RCC framed building with R. C. C. roof and floor. For steel framed building roof /floor shall comprise of RCC slab over profiled metal deck sheets (to be used as permanent shuttering only) over structural beams. Cladding shall be of brickwork/concrete blockwork with plastering on both sides. Roof shall be provided with roof water proofing treatment, as specified elsewhere in the Technical specification. Suitable arrangement shall be provided so as to prevent ingress of water into the cable trenches inside the building from cable entry locations. All air - conditioned areas, shall be provided with the suspended permanently colour coated aluminium false ceiling system (details specified elsewhere) with under deck insulation. Adequate aluminium doors and windows shall be provided for natural lighting, ventilation and view. All windows in air conditioned rooms shall have hermetically sealed double glazing.				
3.06.00	Pent House These shall be of R. C. C. framed structures with columns, beams, slabs and foundations etc. Cladding shall be of brickwork with plastering on both sides. Roof				
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CLAUSE NO.	TECHNICAL REQUIREMENTS
3.07.00 Gypsum Storage Shed 3.08.00 Toilets 3.09.00 Staircases, Gratings, Handrails	shall be provided with roof water proofing treatment as specified elsewhere. Adequate nos. of steel doors and windows shall be provided for natural lighting and ventilation. The Gypsum storage shed shall be RCC framed structure with structural steel work shed with permanently colour coated profiled steel sheet roof and side cladding, grade slab and RCC foundations etc. Roof shall be provided with troughed profile permanently colour coated sheet with adequate slope for quick drainage of rain water. Toilet with potable water line facilities shall be provided in each of the following locations: (a.) In all M. C. C. Rooms (b.) Control Building All floors of transfer points/crusher houses and other facility buildings shall be accessible through staircase. All staircases of Transfer points and crusher house shall be of steel. Cage ladders (min. 450mm wide) shall be provided for access to roof of penthouses, single storey mcc rooms & mumty. All Stairs shall be minimum 1200 mm wide, maximum rise should not be more than 180 mm and minimum tread with 250 mm. Numbers and arrangement (including enclosures etc.) of stair cases shall be such as to meet the fire safety requirement as per guide lines of statutory regulatory bodies. For steel staircases , Stringers shall be of rolled steel channel (minimum ISMC 250) and tread shall be of steel gratings. Out side stairs to transfer points/crusher house shall be open type. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection for treads of stairs in underground TP's All gratings shall be electro forged types. Minimum thickness of the grating shall be 40 mm for indoor installation and 32 mm for outdoor installation. However, at entry or road crossing point's minimum thickness of grating shall be 40 mm The opening size shall not be more than 30mmx100mm. The minimum thickness of the main bearing bar shall be 6 mm or as per design requirement whichever is higher. All gratings shall be designed for minimum imposed load of 500Kgs. / Sq. M. If actual expected load is more than the specified load, then actual load is to be considered. All gratings shall be hot dip galvanized at the rate of 610 g. per sq.m. after surface preparation by means of blast cleaning/ acid pickling. Minimum 1000 mm high hand railing shall be provided around all openings, projections / balconies, walkways, platforms, Stairs, etc. All handrails and ladder Pipes shall be 32 mm nominal bore MS Pipes (medium class) as per IS:1161. Handrails shall have top and middle rails at a height of 1000 mm and 500 mm and the vertical post spacing shall not exceed 1.50 M, with provision of kick Plates (100
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.10.00	mm high and 6 mm thick). All handrails and ladders shall be galvanised at the rate of 610 Gms / Sq. M as per IS:4736. Trenches All trenches for cables or any other underground facility as detailed out elsewhere shall be of R. C. C. Cable trenches shall be provided with pre - cast R. C. C. covers / chequered plate cover. Cable trenches as well as pre - cast covers shall be provided with edge protection angles and lifting hooks. All embedments / block outs as required and specified elsewhere in these specifications shall be provided. Proper drainage arrangement shall be provided. Trench pre - cast cover weight shall not be more than 65 Kgs. Trench covers near entry or at road crossings shall be designed for 10 T wheel load at centre. Pre - cast covers shall be designed for central point load of 75 Kgs. R. C. C. cable trenches shall be filled with sand after erection of cables, up to top level and covered with pre - cast R. C. C. covers. For cable trenches outside buildings, top level shall be 200 mm above G. L and sand filling shall be overlaid with 50 thk. PCC. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection all around cut outs / openings in floor slabs, edges of drains supporting grating/precast RCC covers, edges of R. C. C. trenches supporting pre - cast covers, supported edges of pre - cast cover		
	3.11.00	Cable gallery/trestles Cable galleries/trestles shall be made of structural steel. The contractor can use either rolled sections or tubular steel sections. The tubular steel section shall be of circular/rectangular/square shape. The circular steel tube shall conform to IS:1161 and rectangular/square steel sections shall confirm to IS:4923. The steel structures using tubular sections shall be designed and fabricated as per IS:806 – “Code of Practice for use of steel tubes in general building construction.” and EN 1993-1-8:2005.	
3.12.00	Transformer Foundation		
3.12.01	Foundations of transformers shall be designed for seismic and wind loads in addition to other applicable loads. Block foundations shall be provided for the main transformer block. The oil soak pit, if provided, shall be filled with gravel of size 40mm. The volume of the soak pit shall be sufficient to store complete oil of the transformer/reactor along with 10 minutes of fire water considering only 40% of the volume as available voids between gravel filling. However, in case a separate oil collection tank is provided for the transformer/reactor, oil soak pit of volume equivalent to one-third (1/3) the oil volume of transformer/reactor shall be provided around transformer/reactor. The oil collection tank, in such cases, shall be designed for an effective capacity of complete oil of the transformer along with 10 minutes of fire water. The oil soak pit shall also be provided with a sump at the corner to allow drainage of water/oil from the soak pit. Arrangement for moving the transformer into place using rail cum road, jacking pads and pulling blocks including inserts, as required, shall be provided along with the transformer/ reactor foundations.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
	RCC Firewall shall also be provided between the transformers wherever required. 300 mm thick PCC M20 encasement all around the Pylon supports inside soak pit for fire fighting system shall be provided up to top of gravel filling. Coarse aggregate filling inside the transformer oil soak pit shall be carried out only after construction/erection of Pylon supports and PCC encasement.				
3.12.02	Fencing Fencing with toe wall and steel gates shall be provided around the transformers. Fencing shall comprise of PVC coated GI chain link fencing of minimum 8G (including PVC coating) of mesh size 75 mm and of height 2.4 m above the toe wall. The diameter of the steel wire for chain link fence (excluding PVC coating) shall not be less than 12G. Fence posts shall be of pre – cast R. C. C. of minimum M20 grade. All corner posts will have two stay posts and every tenth post will have transverse stay post. Suitable R. C. C. foundation for the post and stays shall be provided based on prevailing soil conditions. Gates shall be sturdy with locking provisions. Toe walls of brick masonry shall be provided between fence posts all along the run of the fence with suitable foundation. Toe wall shall be minimum 200 mm above the formation level with 50 mm thick P. C. C. coping (1: 1. 5: 3) and shall extend minimum 300 mm below the formation level. Toe wall shall be plastered on both sides and painted with two coats of cement paint of approved colour and shade. Toe wall shall be provided with weep holes at suitable spacing				
3.13.00	Booster Fan Foundation Booster Fan foundations shall be RCC block foundation directly resting on virgin soil/ pile below Ground level. The vertical faces of this block foundation shall be isolated from adjacent footings by providing minimum 100mm thick polystyrene board of type-1 conforming to IS: 4671 with density 20 Kg/cum sandwiched between the vertical face of block foundation and 230 thick brick wall all round.				
3.14.00	~~CHIMNEY~~				
3.14.01	Salient Features ~~Single-flue or multi-flue chimney(s) shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level.~~ ~~The chimney shell (windshield) shall be constructed using slip form shuttering. Internal platforms of steel structure shall be provided for enabling access to various elevations of the chimney and to provide support to the flue liners. Spacing of internal platforms shall not exceed 45.0 M. The platform beams shall be supported on concrete shell using suitable load bearing arrangement in the recesses provided for the purpose. The platform beams getting supported in the chimney shell shall have complete bearing support within the thickness of shell at that location and shall in no case be supported completely/partially on corbels/ brackets from the shell. "Through openings" in shell if provided to facilitate erection of platform beams shall be closed with cast-in-situ RCC closure wall on the external face of the shell. Necessary dowel~~				
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	bars shall be provided in the shell during construction for this purpose. Openings in the concrete shell for flue duct entry, access door & truck entry door at ground level, air ventilation etc shall be provided. Hand railing shall be provided all around internal staircase & around the ventilation voids in the internal platform using min. 32 mm nominal bore MS pipes of medium class conforming to IS:1161. Spacing of railing posts shall not be more than 1500 mm centre to centre with a minimum height of 1200 mm. The handrail shall have three rows of horizontal members between the railing posts including the top member. Kick plate of min. size 100x6 thick shall be provided in the hand railing. The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be bottom supported and shall be profiled into a circular shape to connect to the flue liner. The flue duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic fluoroelastomeric fabric expansion joint. The expansion joint in the flue liner shall comprise of non-metallic fluoroelastomeric material suitable to withstand a temperature of 300 Deg C, shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable to withstand a temperature of 300 Deg C and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh. Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from chimney shell with chequered plate floor panels and pipe handrails, shall be provided for full height of the chimney and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch. The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, mild steel wind strakes (if required), all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation obstruction lighting with photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but reasonably implied and necessary to complete the job in all respects. Aviation Warning Lights (AWL) shall be mounted on door panel of required size (open able from interior of chimney shell) fixed to openings in the chimney shell at locations and levels specified elsewhere. Suitable provision for approach to the AWL shall be provided at the platform level. AWL shall be located at about 1-1.5 metre above the top of platform to enable easy handling for maintenance. The size of roll-up door shall be determined based on minimum requirement for ventilation and transportation & erection of flue segments.		
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3.14.02	Design Concept			
	Design and construction of various components and systems of the chimney shall be in accordance with relevant Indian Standard and where provisions are not covered in Indian Standard, reference shall be made to ACI, BS, CICIND and other international standards. In case of any conflict between this document and the Indian and International Standards, the stipulations of this document shall prevail. Imposed loading for design of all chimney components shall not be less than 5 kN/Sq.m. An additional 25% of liner load shall be taken as impact loading for liner erection in addition to the liner load. The min. thickness of web for plate girders shall be kept as 12 mm. Seismic forces on the chimney system shall be determined based on site specific seismic information provided elsewhere in this document. Wind forces on the chimney system shall be determined based on site specific wind design criteria provided elsewhere in this document. The chimney and its components shall be designed to resist the most onerous forces resulting from all the possible combinations of the various loadings. Design of all chimney components shall be based on working stress method.			
3.14.03	Wind Shield			
	The wind shield shall be designed for vertical loading, cross wind loading, seismic loading, circumferential wind loading, thermal gradients etc. The load calculation and load combinations shall be as detailed in IS 4998 (Part 1) : 1992. The wind shield shall be analysed for cases with and without flue liner loads. Forces/stresses in the wind shield due to eccentricity effects of local (e.g. corbel) loadings, insulations effects, rotation of chimney foundations, construction tolerances and moments of second order shall also be considered. Seismic response of the chimney shall be computed by the response spectrum method. At least, the first five modes of vibrations shall be used for this analysis. The cross wind analysis of the chimney shall be carried out irrespective of the value of the Scruton Number for the chimney and other empirical considerations which suggest structural immunity to cross wind oscillations. The effect of the openings/cut-outs in the chimney shell shall be duly considered in the design of the windshield. The minimum thickness of shell shall not be less than 500mm. The stresses for the shell design shall not exceed the limits given in Cl. 7.0 of IS:4998 (PART-I) 1975 for various combinations of loads, excepting the stress in concrete for the case of dead load + wind load which shall not exceed $0.30f_{ck}$ where f_{ck} is the characteristic compressive strength of concrete. The minimum vertical reinforcement shall be 0.3% of the concrete area. The maximum spacing of the reinforcement bars shall not be more than 250 mm on each face. The minimum circumferential reinforcement shall be 0.2% of the concrete area. The maximum spacing of the reinforcement bars shall not be more than 200 mm on each face. The circumferential reinforcement in the top 3 meters of the windshield			
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3.14.04	shall be twice that required from design forces. The clear cover to reinforcement shall be 50 mm. There shall be a continuous ring of concrete shell without any opening for a height of atleast 5m below the soffit of flue duct openings. There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a sudden change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level. The diameter of the reinforcing bar for the main vertical reinforcement of shell shall not be less than 25mm for a shell height upto the top level of flue duct opening. Shell thickness between any two 10m reference levels shall not vary more than 150mm. The minimum thickness of shell/closure wall at beam support recess/ opening locations shall be 100mm. Grade of concrete for chimney shell, and other super structure shall be minimum M 30. Only OPC cement shall be used for Chimney shell and other super structure. The final design shall be checked & verified by 'Wind Tunnel Test' and shall be conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located in the area or in the future expansion stage of the project shall be determined along with the other topographical features of the local area through model test.			
	Flue Liners The flue gas parameters & various operating conditions for selection of flue liner material, material specification for flue liner and the criteria of flue gas exit velocity for sizing the flue liner shall be as specified elsewhere in the specification. For flue liner with base metal as mild steel, the thickness of the base metal shall be determined from structural considerations. The thickness of any clad metal/coating/block lining etc. provided on the base metal shall not be considered for computing the structural strength of flue liner. The minimum thickness of the mild steel base metal shall, however, not be less than that specified elsewhere in the specification. Two manholes placed diametrically opposite shall also be provided in each flue at all internal platform levels. The supporting/restraining arrangements of the liners should be such that expansion of the liners longitudinally or circumferentially is not restrained. Clean-out door shall be provided below the flue for the removal of ash.			
3.14.05	Internal Platforms The platforms shall be designed for dead, imposed (live), erection work and other possible loadings and temperatures effects. These platforms shall provide support and lateral restraint to the steel liners and provide access for inspections and maintenance. Forces imposed on the floors due to lateral restraint of flues shall be enhanced aptly for impact effects. These platforms shall also be designed suitably for			
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3.14.06	the liner erection works. The platform shall be made up of chequered floor panels supported on grid of structural steel beams. All beams shall have bolted connections. The maximum permissible deflection in main steel girders supporting flue liner shall be span/1000.			
	Internal Staircase The staircase shall have a clear passage way width of not less than 800 mm and a clear headroom of not less than 2100 mm. The riser height shall not be more than 175 mm and tread width shall not be less than 225 mm.			
	3.14.07	Foundation The chimney foundation shall be designed for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any portion of the foundation for any loading condition. Since chimney is a wind sensitive structure no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. No allowance shall be made in the stresses for design of foundation for wind loading. The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum M 25.		
3.14.08		Thermal insulation The insulation shall be semi-rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be used. The density of insulation shall not be less than 64 kg/cu.m for resin bonded glass wool insulation and 100 kg/cu.m for resin bonded rock wool. The coefficient of thermal conductivity of insulation shall not be more than 0.52mW/cm/oC at a mean temperature of 100oC. The insulation thickness shall be determined based on the maximum/minimum ambient temperature, surface air velocity worked out based on the draught of ventilation air in the annular space between the flue liner and chimney shell, insulation surface emissivity of 0.3 and the insulation cold face maximum temperature not exceeding 55 degree Celsius. The draught of air in the annular space shall be the natural draught created by the heating of air by the flue liner and the air being vented out through the openings in the chimney shell. The increase in the annulus air temperature due to the rising heated air shall be taken into account while calculating the insulation thickness. The insulation thickness shall not be less than 100 mm, in any case, and shall be provided in two layers with the second layer of insulation covering the joints of the first layer. The insulation shall be wrapped on the outer-most surface with galvanised wire mesh using MS galvanised pins and speed washer.		
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3.14.09	Chimney Painting		
	(i) All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) except surfaces of steel wind strakes shall be painted as specified in corrosion protection clause of this specification. (ii) All exposed surfaces of steel wind strakes shall be painted with epoxy phenolic coating system having total 240 microns DFT. a) All steel surfaces shall be provided with two component epoxy primer coat (having solid by volume minimum 51% ±2%) of minimum 70 micron DFT to be applied over blast cleaned surface conforming to Sa 2½ finish of ISO 8501-1 with surface profile 40-60 Micron. The primer coat shall be applied in shop immediately after blast cleaning by airless spray technique. b) Primer coat shall be followed with the application of Intermediate coat of epoxy phenolic coating (solid by volume minimum 63%) of minimum 100 micron DFT. This coat shall be applied in shop after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied in shop after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer. (iii) All steel parts embedded in concrete like Strake embedment assembly including bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes. (iv) The inside surface of chimney shell above roof, horizontal surface of shell at top, underside of concrete roof slab, external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT. a) All concrete surfaces shall be provided with two component transparent polyamide cured epoxy sealer coating (having solid by volume minimum 40% ±2%) of minimum 50 micron DFT to be applied over cleaned surface in multiple coats. Surface to be coated shall be absolutely dry, clean and dust free. b) Sealer coat shall be followed with the application of Intermediate coat of epoxy phenolic coating (solid by volume minimum 63%) of minimum 100 micron DFT. This coat shall be applied after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours		
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3.14.10	exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer. d) The entire external surface of chimney shell shall be painted with epoxy phenolic coating as specified in (iv) above in alternate bands of 'signal red' and 'bright white' colours.		
	Electrical System 415V, normal and emergency AC power supply for chimney shall be derived from main plant power supply system. Emergency supply shall feed 20% of platform lighting, 50% of staircase lighting, aviation obstruction lighting and elevator load. All other loads shall be connected on normal power supply. Ambient temperature for design of all equipment shall be considered as 55 deg. C which is likely to be encountered inside the chimney. The equipment shall be suitable for installation and render trouble free operation at higher ambient temperature and rigorous weather conditions prevailing at chimney. All equipment supplied shall comply with relevant IS Standards. The distribution boards of chimney shall comprise switch fuse units of appropriate ratings. Emergency board shall have two incomers, one from emergency supply and other from normal AC distribution board itself. Auto changeover scheme shall be provided in emergency board to enable changeover to healthy source on failure of any source. Dry type isolating transformer of Dyn connection shall be provided in emergency board to obtain neutral lead, in case 3 phase 3 wire emergency supply is derived from main plant. Various platforms shall be illuminated by dust tight HPSV well glass lighting fixtures. Average illuminations level of 150 lux shall be maintained on equipment and 70 lux on platforms & 100 lux on staircases (minimum 1 lighting fixture at each landing).Any additional fixture to take care of dark patches/shadows shall also be provided. Lighting system shall be controlled through MCB provided in lighting panel. A lighting and power panel each shall be located at grade level and at other in between levels as required. All distribution boards, aviation lighting controls, etc. shall be located at grade level only. At each platform, 1 No. 63A, 415V welding receptacle and 1 No. 20A, 240V receptacle shall be provided and shall be fed from power panel. Wiring installation for lighting fixture shall be of PVC insulated copper/aluminium wires through galvanised steel conduits. Aviation obstruction lighting system shall conform to the requirements of the latest rules and regulations of the International Civil Aviation Organization (ICAO), National Airports Authority (NAA) and Directorate of Air Routes and Aerodromes (DARA). The type of aviation obstruction lighting system shall be of medium intensity aviation obstruction lights having an effective intensity of 2000 to 20,000 cd depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 20000 cd. The intensity of lights shall be 20000 cd ± 25% at twilight and shall reduce automatically to a night time intensity of 2000 cd ± 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction		
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	lights and there will be four light units per level. The lowest level should not be lower than 45 meters above the ground and vertical spacing of the intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc.. A temporary aviation obstruction lighting system shall be provided during construction of the chimney. Cables from distribution board to lighting panels/power panels/receptacles shall be 1100V grade, multicore FRLS HR-PVC insulated, PVC inner sheathed, armoured, PVC outer sheathed stranded copper/ Aluminum laid on galvanised sheet steel cable trays. Cables shall be terminated using double compression type cable glands and solder less crimping type tinned copper cable lugs. Minimum size of the power cable shall not be less than 2.5 sq.mm copper or 4 sq.mm Aluminum. Minimum size of control cable shall not be less than 1.5 sq.mm. Lightning protection system shall comprise minimum 3 vertical air terminations for each flue liner, horizontal air terminations and minimum 4 Nos. of down conductors spaced 90 degrees apart routed all along chimney height on external surface and connected to the earthing system. Down conductors shall be of minimum 50x6 mm galvanized steel strip. Each down conductor shall be provided with a test link at 1 metre above ground level. Each test link shall be enclosed in a galvanised sheet steel enclosure. Above ground level earthing and lightning protection system shall comprise galvanised steel strips. These materials provided at top 12 meters shall have additional coating of 2 mm thick seamless lead cover and the accessories like nuts, bolts, washers etc. shall be of stainless steel to take care of corrosion. Chimney earthing system shall be interconnected to main plant earthing system. A temporary lightning protection & earthing system shall be provided during construction of the chimney till a permanent lightning protection & earthing system is installed. In no case reinforcement bars of Shell should be used as earthing Down Conductors Communication system comprising of telephone socket at every internal platform level and at grade level, necessary wiring installation, a telephone hand set, junction boxes etc. shall also be provided. Telephone cables shall be of minimum 0.6 mm diameter annealed high conductivity electro copper conductor, PVC insulated, twisted, PVC tape wrapped, screened, rip corded, PVC sheathed, conforming to relevant ITD (Indian Telephones Department) specifications. All equipment to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all type tests as listed below: (A) Distribution boards/panels-Degree of protection tests (B) Aviation lights: (1) Intensity Test (2) Degree of protection test For various equipment, the technical requirements and practices shall conform to the relevant clauses of the main plant electrical specification.		
3.14.11	Rack and Pinion Elevator A rack and pinion elevator, with a load carrying capacity of 400 kg (min) (passenger cum goods), cabin floor size of 1100 mm x 1000 mm (min.) and an operating speed		
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	of 40 m/min. (approx.), shall be provided for travel from the grade level to the top of the chimney. A landing platform shall be provided at all access/ platform levels. The elevator shall be of a proven and approved make. Enclosure shall be fabricated from tubular steel and expanded metal or wire mesh, 2.1 m high (Approx.). A Safety device comprising of an over speed governor in constant mesh with the rack by means of a flame hardened steel pinion shall be provided to protect the cab against over speed during the cab downward motion and the same shall actuate the brake mechanism and stop the down ward motion gradually. The lift shall be installed using anchor fasteners. The electrical requirement of the system shall conform to the main electrical specification. Drive motor shall be of S3 duty class with CDF of 25% and maximum number of 120 starts per hour in 55 degree Celsius ambient temperature. The motor shall be provided with internal 220V AC single phase space heaters or an alternate heating system. The elevator shall be supplied, installed, painted, tested, commissioned etc. complete with all mandatory spares (as specified in Part-F of this specification) and operation maintenance manual		
4.00.00	Drainage & Water Supply Works		
4.01.00	Drainage System: The drainage arrangements shall be so planned so as to ensure quick disposal of drainage water without stagnation and / or overflow. It is envisaged to clean the facility buildings etc. with water periodically. Minimum 4 nos. down comers shall be provided in each building at corners. For Conveyors, each down comer shall lead the water / slurry to pit (of 2 Cu.M capacity) to allow settling of lime/gypsum. The water from the pit shall overflow into contractor's R.C.C drain, which will lead the discharge finally into owner's drain routed alongside the nearby road. For Ball Mill building, Gypsum dewatering building, FGD control room building, peripheral drains (Brick drains with steel gratings provided around the building) shall lead the water / slurry to a local pit (of 2 Cu. M. capacity) near each facility to allow settling. The water from the pit shall overflow into contractor's R.C.C drain, and finally into owner's drain routed alongside the nearby road. In case of Control rooms and M. C. C. buildings Pump houses, etc, water / slurry coming from down comers shall discharge into peripheral drains (Brick drains with steel gratings provided around the building) which will lead the water / slurry into contractor's R.C.C drain, which will lead the discharge finally into owner's drain routed alongside the nearby road. Contractor's scope shall also include construction of necessary culverts under the rail lines / roads as per railway / I. R. C. standards and approval of Railway culverts from concern Railway authorities.		
4.02.00	Internal and external water supply, drainage etc. The scope for potable water supply includes all distribution systems, tanks, pipes, fittings etc. as required and as described here or elsewhere in the specifications.		
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	The scope for service water supply and dust control water supply shall be as described elsewhere in the specifications. For water supply, medium class galvanized mild steel pipes conforming to IS: 1239 shall be used. All facility buildings shall be provided with open surface brick drains of minimum size of 300 mm width and 300 mm depth all around the periphery. All drains excepting the peripheral drains around facility building shall be of R. C. C. construction. Drains shall have removable steel grating cover and shall be provided with edge protection angles. The scope for foul water from toilets shall include layout and laying of sewers up to the Employer's main sewer line for sewerage system together with all fittings and fixtures and inclusive of ancillary works such as connections, manholes and inspection chambers within the building and from the building to the Employer's sewer line. For rain water down comer and those to be used for conveying water / slurry generated from cleaning of buildings floors, Galvanised MS pipes conforming to IS: 1239 (for 150 mm NB Medium grade pipes) with welded joints shall be used for MCC buildings, penthouse, control rooms, ball mill building, gypsum dewatering building, storage sheds. Galvanising shall be as per IS: 4736. The minimum mass of zinc coating shall not be less than 400 gms/sq.m. as per IS:6745. The zinc coating shall be smooth and shall be subjected to testing as per IS: 2633, for uniformity of coating. The zinc coating shall be free from all defects as per IS: 2629. All rain water down comers shall be provided with roof drain heads and complete with shoes bends, junctions, sockets, adapters, brackets and finished with anti corrosive painting over a coat or primer. For design of building drainage system IS: 1742 shall be followed. For sanitary / sewerage pipes above ground, sand cast iron pipes conforming to IS : 1729 with leak proof lead joints. For underground drain pipes, minimum class NP - 2 pipes conforming to IS: 458. At road crossings, concrete pipes of class NP 3 conforming to IS: 458 and at rail crossing R.C.C. box culvert to be provided. For sewerage below ground stoneware pipes conforming to IS: 651 with concrete bedding and haunch.		
5.00.00	COLOUR COATED AND OTHER SHEETING WORK		
5.01.00	Material a) Wall Cladding & Roofing Material Troughed permanently colour coated sheet of approved shade and colour shall be		
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5.04.00	For profiled metal decking sheets (to be used for RCC floor slab or roof slab) the sectional modulus and moment of inertia of troughed profile per meter width shall be so as to limit the deflection of sheets to span/250 under total super imposed loading (DL +LL) comprising the self-weight of metal deck sheet, dead weight of green concrete and an additional construction load 100kg per sq.m for two span condition. The section modulus and moment of inertia of troughed profile shall be computed as per the provisions of IS 801 for satisfying the deflection and strength requirements. For metal deck sheets used for roofing (with or without RCC) and side cladding, the sectional modulus and moment of inertia of troughed profile per metre width shall be such that the deflection of sheets is limited to span/250 under design wind pressure for two span condition. The sectional modulus and moment of inertia of troughed profile shall be computed as per the provisions of IS 801 for satisfying the deflection and strength requirements. No increase in allowable stress is permissible under wind load condition.			
	Fasteners Side cladding/roofing/decking sheets shall be fixed to the runner/purlins using self-drilling special coated fasteners confirming to corrosion resistant class 3 of AS3566 and tested for 1000 hours salt spray test. Spacing of Self-drilling fasteners in transverse direction (along runners/purlin) shall be equal to the pitch of trough or 250(+/-100) mm, whichever is lesser and in longitudinal direction at every runner/purlin location. Shear anchor studs shall also be provided through troughed permanently colour coated metal decking sheets metal deck, which are to be used as permanent shuttering, at regular interval on all top flange / flange plate of structural beams. The shear anchor studs for fixing metal deck sheet to floor structural beams shall conform to Type-B studs specified in AWS D1.1/D1.1M or equivalent as shear connector of 19mm diameter and 100mm length manufactured from cold drawn round steel bars conforming to the requirement of ASTM A 29, of grade designation 1010 through 1020, of standard quality with either semi-killed or killed, welded by Drawn Arc Stud Welding through metal deck sheet. The shear anchor studs for fixing metal deck sheet to roof structural purlins shall conform to Type-B studs specified in AWS D1.1/D1.1M or equivalent as shear connector of 16mm diameter and 65mm length manufactured from cold drawn round steel bars conforming to the requirement of ASTM A 29, of grade designation 1010 through 1020, of standard quality with either semi-killed or killed, welded by Drawn Arc Stud Welding through metal deck sheet. Alternatively, J/U type hooks shall be used in roofing which shall be provided in transverse direction (along runners/purlin) at a spacing equal to the pitch of trough or 250(+/-100) mm, whichever is lesser and in longitudinal direction at every runner/purlin location.			
5.05.00	Miscellaneous Details To minimize the number of joints, the length of the sheet shall preferably be not less than 4.5m, cut pieces shall not be used, unless specifically approved by the Engineer. However, the actual length shall be such so as to suit the purlin / runner spacing.			
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5.06.00	Lap between the sheets shall be at least 150mm in the longitudinal direction and at least one crest wide in the transverse direction which shall be properly anchored / fixed with fasteners. Z spacers if required shall be made of at least 2 mm thick galvanised steel sheet of grade 350 as per IS 277 Sealant used for cladding shall be butyl based, two parts poly sulphide or equivalent approved, non stainless material and be flexible enough not to interface with fit of the sheets Filler blocks as a trough filler shall be used to seal cavities formed between the profiled sheet and the support or flashing. The filler blocks shall be manufactured from black synthetic rubber or any other material approved by the Engineer. All flashings, trim closures, caps etc. required for the metal cladding system shall be made out of plain sheets having same material and any weather/moisture sealants with appropriate material and coating specification as mentioned above for the outer face of the metal cladding. Overlap shall be min. 150 mm or as specified by manufacturer.		
	Pre-Fabricated Insulated Metal Sandwich Panels For structures where Pre-Fabricated Insulated Metal Sandwich Panels shall be used for Roofing, the sandwich panels shall comprise top sheet as troughed permanently colour coated sheet & bottom sheet as plain permanently colour coated with 50mm thick insulation sandwiched between the two sheets. Each sheet shall be i) either of steel with minimum 0.6mm bare metal thickness (i.e. excluding the thickness of galvanizing/aluminium-zinc coating and painting) of grade G250 as per AS1397 / grade SS255 as per ASTM A653M / grade S250GD as per EN 10326 with zinc coating to class Z275 / aluminium-zinc alloy coating to class AZ150 ii) or of minimum 0.5mm BMT (i.e. excluding the thickness of galvanizing/aluminium-zinc coating and painting) of grade G350 as per AS1397 / grade SS340 class 4 as per ASTM A792M / grade S350GD as per EN 10326 with zinc coating to class Z275 / aluminium-zinc alloy coating to class AZ150 iii) or of steel of minimum 0.4mm BMT (i.e. excluding the thickness of galvanizing/aluminium-zinc coating and painting) of grade G550 as per AS1397 / grade SS550 as per ASTM A792M / grade S550GD as per EN 10326 with zinc coating to class Z275 / aluminium-zinc alloy coating to class AZ150. Alternatively aluminium feed material of minimum bare metal thickness of 0.7 mm of aluminium alloy of Series 31000 and above as per IS 737 and IS 1254. Metal sheets (steel or aluminium) shall be colour coated with total coating thickness of at least 40 microns (nominal) dry film thickness (DFT) comprising of Silicon Modified Polyester (SMP with silicon content of 30% to 50%) paint or Polyester paint, of minimum 20 microns (nominal) SMP or polyester paint on one side (exposed face), over minimum 5 micron (nominal) primer coat and minimum 10 micron (nominal) SMP or Polyester paint over minimum 5 micron (nominal) primer coat on other side. SMP and Super Polyester paint shall conform to product type 4 of AS/NZS 2728. Troughed sheet shall be of approved profile, sectional properties, (suitable for the specified loading / deflection and purlins / runners spacing), colour and shade.		
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5.07.00	Special coated fastener conforming to corrosion resistant Class 3 of AS3566 and tested for 1000 hours salt spray test shall be used for fixing Pre-Fabricated Insulated Metal Sandwich Panels with the structural members below. The contractor shall prepare working drawings of sheeting system including end and side laps, fixing details etc. before starting sheeting work at site. Polycarbonate Sheets The polycarbonate sheet to be used for cladding and glazing purpose in conveyor galleries, Transfer points & pump houses shall have toughed profile to match with the metal cladding profile. Minimum 3.0mm thick fire retardant and UV resistant polycarbonate clean sheet of approved make shall be used. The polycarbonate sheet shall be installed along with the metal cladding so as to have a watertight lapping arrangement. Suitable detailing shall be made to cater for the thermal expansion. IS 14434 to be referred for other details		
	6.00.00	Roof Details	
6.01.00	Roof slab shall be minimum 150 mm thick(above the top surface (crest) of the metal deck sheet) and shall have minimum 10 dia HYSD reinforcement bars placed at 200 mm center both ways at top and bottom.		
6.02.00	900 mm high and minimum 100 mm thick R. C. C. parapet wall shall be provided over roofs of all buildings. Parapet wall shall have suitable coping. External face of parapet wall of the buildings provided with metal cladding shall also be finished with metal cladding of design and colour as per approved architectural drawings.		
6.03.00	Junction of roof and parapet shall be provided with 150 x 150 mm size concrete fillet.		
6.04.00	Drain level shall be provided with 45 x 45 cm size khurras having minimum thickness of 30 mm of M-15 concrete over PVC sheet of 1 m x 1m x 400 micron and finished with 12 mm 1 : 3 cement : sand plaster.		
6.05.00	Roofs of all control rooms, M. C. C. rooms, penthouse etc., shall have roof water proofing treatment. Roof water proofing treatment shall be as follows: 1) Application of polymerised mastic over the RCC roof to achieve smooth surface as primer coat. 2) Application of high solid content liquid applied urethane based elastomeric water proofing membrane, over the primer coat, to give uniform joint less dry film thickness of minimum 1.5 mm (as per ASTM C 836 and C 898). 3) For efficient disposal of rain water, the run off gradient for the roof shall not be less than 1: 100. This gradient shall be provided by screed concrete M-15 (using 12.5 mm coarse aggregate) and / or cement mortar (1: 4) over the elastomeric water proofing membrane with 25mm thick cement mortar (1:4) topping. 4) Wearing course at top, shall consist of 25 mm thick P. C. C. (M-15) cast in panels of maximum 1.2 x 1.2 m size and reinforced with 0.56 mm diameter galvanized chicken wire mesh and sealing of joints using sealing compound / elastomeric water proofing membrane. Pathways for handling of materials and movement of personnel shall be provided with 22 mm thick chequered cement concrete tiles as per IS : 13801 for a width of 1000 mm in place of P. C. C.		
6.06.00	For efficient disposal of rain water, the run off gradient for the roof shall not be less than 1:100. This gradient can be provided either in structure or subsequently by		
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	screed concrete M-15 (using 12.5 mm coarse aggregate) and/ or cement mortar (1:4). However, minimum 25 mm thick cement mortar (1:4) shall be provided on top to achieve smooth surface.		
6.07.00	Medium class galvanised mild steel pipes conforming to IS: 1239/ IS: 3589 with welded joints shall be provided for rain water down comers to drain off rain water from the roof. These shall be suitably concealed with masonry work, to match with the exterior finish. The number and size of down comers shall be governed by IS: 1742 and IS: 2527. RCC roof shall be provided with 45 x 45 cm size Khurras having minimum thickness of 30 mm with M-15 concrete over PVC sheet of 1mx1mx400micron and finished with 12 mm thick cement sand plaster 1:3.		
6.08.00	Access to RCC roof of Gypsum dewatering building, FGD Control room building, MCC building, Ball mill building shall be through RCC staircase, and roof access to all other buildings all shall be through cage ladder as per requirement.		
6.09.00	Fillets at junction of roof and vertical walls shall be provided with cast - in - situ cement concrete (M-15) nominal mix followed by 12 mm thick 1:4 cement sand plaster.		
6.10.00	The rainwater down comers shall be provided with suitable C.I. grating at inlet point.		
7.00.00	RCC Floors, Paving & Grade Slab details The floor slabs shall be minimum 150 mm thick(above the top surface (crest) of the metal deck sheet) and shall have minimum 10 dia HYSD reinforcement bars placed at 200 mm center both ways at top and bottom. In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering. The detailed material property requirement of metal deck sheet is specified elsewhere in the specification. These profiled metal deck sheets shall be fixed to the structural steel beams/ purlins using headed shear anchor studs specified elsewhere in the specification. Chequered plates (used for floors, walkways etc.) shall be minimum 6 mm thick. Mild steel flats/angles of suitable size shall be welded to the bottom portion of chequered plates at a designed spacing to stiffen chequered plates suitably. Chequered plates shall be fixed by staggered welding of suitable size. Floors of trenches shall have integral finish to concrete base. Toe guard of size 100 x 6 mm shall be provided at various openings provided in floors e.g. around stair case openings, chute openings and other similar cutouts. For conveyor walkways, angle runner to act as toe guard shall be provided. R. C. C. floors (where no brick masonry walls are provided) shall be provided with handrails all along the periphery. RCC paving of minimum 150 mm thick with M25 grade concrete, over an under bed as specified herein shall be provided for areas mentioned below. RCC paving shall be designed as rigid reinforced concrete pavement for the crane/ vehicular/ equipment movement loads which the paving has to bear. The under bed for paving shall consist of preparation and consolidation of sub-grade to the required level, laying of stone soling of 200mm compacted thick for normal duty paving and 400mm		
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	compacted thick for heavy duty paving with 63 mm and down aggregate with interstices filled with selected moorum/ non-expansive soil followed by 75 mm thick 1:4:8 PCC (1 part cement, 4 parts sand and 8 parts stone aggregate) with 40 mm nominal size aggregate. For normal duty paving, reinforcement of the RCC paving shall consist of minimum 8mm dia bars @ 200 mm c / c in both directions at the centre of the slab. For heavy duty paving/ passage, reinforcement of the RCC paving shall consist of minimum 10mm dia bars @ 200 mm c / c in both directions at the centre of the slab. Paving areas shall be provided with the metallic hardener floor finish as specified elsewhere in the specification. Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings. These passage areas shall be provided with heavy duty paving for movement of heavy vehicles. The top surface of the passages shall be finished with 50 mm thick metallic hardener topping. Heavy duty paving shall also be provided for the areas in the equipment lay down area, unloading & maintenance area with 50 mm thick metallic hardener topping. Lightly loaded areas such where no heavy traffic movement is envisaged shall be provided with Normal Duty paving. All facility buildings shall be provided with 750 mm wide plinth protection all around. It consists of 50 mm thick P.C.C. M-20 grade with 12 mm maximum size aggregate over 200 mm thick stone soling using 40 mm nominal size rammed, consolidated and grouted with fine sand An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection. Further, heavy duty paving shall be provided for passages connecting the outer periphery road to have access to the various facilities/buildings. Plinth level of all buildings shall be kept at least 500 mm above the finished grade / formation level. Suitable open RCC drains shall be provided to dispose off storm water drain. The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain. Sewer lines (Cast Iron), interconnected by sewer manholes (RCC) at regular intervals (not exceeding 30 meter centre to centre) shall be provided to dispose off sewage from FGD block to sewage pump house. GRADE SLAB OF BUILDINGS AT GROUND FLOOR In buildings, the grade slab shall consist of 150mm thick RCC M25 grade base slab over an under bed as specified below. The under bed for ground floor slab shall consist of 75mm thick 1:4:8 PCC on stone soling of 200mm compacted thick with 63 mm and down aggregate with interstices filled with well graded selected sand/ moorum/ non-expansive soil on compacted and dressed sub - grade. Reinforcement for the slab shall consist of minimum 8mm dia. bars @ 200 mm c/c at top & bottom of the slab in both directions. However, at unloading & maintenance area, stone soiling of minimum 400mm thick and grade slab with minimum 10mm dia bars @ 200 mm c/c at top and bottom in both directions shall be provided. Further, top surface of grade slabs shall be finished with 50mm thick metallic hardener topping.		
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8.00.00	Brickwork and allied masonry works		
	All brick walls shall be non - load bearing in-filled panel walls.		
	All brickwork shall be designed as per Indian Standards and shall be plastered on both faces. All external walls shall be minimum one brick thick in 1: 6 cement: sand mortar. Brick walls shall be provided with 12 mm and 18 mm thick 1: 6 cement: sand plaster on smooth and rough face of the brick work respectively.		
	Bricks to be used in brickwork shall be of minimum Class designation 50.		
	Brickwork cladding for various structures shall be so provided that there is a clear gap of 40 mm between inside face of external brick wall and outside face of column flange. Structural steel wall beams supporting brickwork shall be suitably encased with plaster or 1: 2: 4 concrete as the case may be. In case of box type steel beam, encasement shall be done with cement sand plaster in specified thickness and proportions over G. I. wire netting of 0.9 mm thickness.		
9.00.00	Parapets, chajjas, windows and door heads, architectural faces, fins etc. shall be provided with drip course in 1 : 4 cement sand mortar.		
	50 mm thick Damp proof course shall be provided at plinth level for all brick wall.		
	All R. C. C. ceilings shall be rendered smooth and finished with whitewash unless otherwise specified. Ceiling of control rooms, M. C. C. rooms (except areas provided with false ceiling) shall be provided with 6 mm thick plaster.		
	Earthing Mat		
	40 mm Dia MS Rods as earthing mat, placed at a distance of 1.0M away and at depths between 0.60M and 1.00M shall be supplied and laid all around the periphery of buildings, structures, and outdoor equipment, as per the approved drawings. Risers of 40 mm Dia MS Rods and connecting to the above Earthing mat shall also be supplied and laid in position by the Contractor, as per the approved drawings. Risers shall be laid up to a height of 300 mm above the local Ground level, at each of the columns of the buildings on outside of the buildings, and minimum 2 (Two) numbers for structures and outdoor equipment. The contractor also supply and lay necessary number of 3.0 M deep vertical 40 mm Dia MS Rods Earthing electrodes and connecting them to the Earthing mat, as per the approved drawings and the supplying and laying of 40 mm Dia MS Rods for connecting the Contractor's earthing mat with the Employer's earthing mat separately at two locations.		
10.00.00	SITE LEVELLING		
	Site leveling of gypsum storage area , lime storage area , gypsum dewatering area , truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing. Bidder shall deploy adequate number of experienced site leveling contracting agency(s) with requisite earth moving and compacting equipment to complete the work as per schedule.		
Bidder shall carry out the topographical survey before he commences detailed design and site leveling. This survey shall cover the entire FGD area including gypsum			
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	storage ,gypsum handling area , lime storage area ,gypsum dewatering area , truck hopper area, limestone grinding and slurry storage area in Bidder's scope of work. Based on field observations the contractor shall prepare and submit for Owners review the survey maps of the surveyed sited on suitable scale, indicating grid lines, contour lines and demarcating all permanent features like roads, railways, waterways, buildings, power lines, natural streams, trees etc. For each area two sets of survey maps shall be prepared and submitted, one showing the spot levels and contours with grid lines and the other showing the grid lines, contours and permanent features Since the construction of roads and drains for the FGD area including gypsum storage ,gypsum handling area , lime storage area ,gypsum dewatering area , truck hopper area, limestone grinding and slurry storage area is included in the scope of Bidder, it shall be the responsibility of the Bidder to ensure that these facilities are also constructed along with site leveling works. Bidder shall ensure that road access and drainage facilities for each block is available when site leveling in that block is completed. Unless otherwise instructed by the Engineers, all roads and drains within a block shall be constructed by the bidder within a month from the date of completion of site leveling of that block. The specified formation level(s) shall be achieved either by excavation where the existing ground levels are higher than the specified formation level or by raising by controlled filling with borrowed earth where the existing ground levels are lower than the specified level All materials arising out of site clearance and excavation shall be the property of owner. They shall be dealt with in the manner specified by the Engineer. Earth / boulders / rock etc. excavated and useful portion (serviceable materials) of trees cut shall be stacked at suitable places within Owner's acquired land for the plant including the reservoir and the ash disposal area in a manner as directed by the engineer. Woods, branches, trunks of trees shall be termed as serviceable material. Other materials like twigs, leaves, roots, vegetable and organic matters etc. shall be termed as unserviceable material and shall be sorted out from the serviceable materials before disposal. They shall be cleared from the area and disposed off at places within Owner's acquired land for the plant including the reservoir and the ash disposal area in a manner as directed by the engineer. If the excavated material is suitable and accepted by the Engineer as fill material, the same can be used for filling in other areas where raising by filling is required. Otherwise the same shall be taken and stacked at places(s) within the plant boundary as directed by the Engineer. Filling with rock shall be done only after the written permission of the Engineer in the following manner: Filling with rock shall be done only in areas identified for laydown and preassembly . Original ground after removal of all organic and vegetable matters shall be consolidated by rolling as directed by the engineer subject to a minimum of six passes of 8-10 tonnes roller.		
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	- Excavated rock shall be laid (on original ground or after filling 300 mm thick layers of soil as specified), in layers not exceeding 1000 mm and rolled with with vibratory roller (10-15 tonnes static weight) with minimum six passes. - Over the compacted layer of rock, soil shall be filled in horizontal layers not exceeding 300mm in compacted thickness. The soil shall be compacted as specified elsewhere. - It shall be ensured that the top soil layer is in minimum 3 layers of 300 mm each. To achieve this the thickness and number of rockfill layers below can be suitably adjusted. Contour map and spot levels of the area based on the preliminary survey carried out by Owner is enclosed for the purpose of guidance of Bidder. However, Owner does not lake any responsibility about the accuracy of the survey details furnished and any variation of the said data shall not constitute a valid reason for changing the terms and conditions of the contract. Bidder is requested to carry out his independent assessment of the existing ground levels before furnishing his. bid Detailed survey shall be carried out by Bidder after award of work and all findings as stated earlier shall be submitted for Owner's review. Before commencement of cutting/filling, all organic and vegetable matters like grass. Plants shrubs bushes, weeds, trees (with girth less than 30 cm measured at height of 1m above ground level) etc. in the areas to be filled, shall be completely removed along with their roots and disposed off. .It shall also be ensured that the area to be filled is clear of any water, slush etc. Original ground shall be compacted by rolling as directed by the Engineer subject to a minimum of six passes of 8 to 10 tonne roller The earth shall then be spread in horizontal layers not exceeding 300 mm in compacted thickness. Each layer shall be watered and compacted with proper moisture content and with such equipment as may by required to obtain a compaction of 95% or more of Standard Proctor's maximum dry density. The moisture content of the fill material shall be controlled to obtain near optimum moisture content during compaction. The fill material shall be tested for determining optimum moisture content and maximum dry density by Standard Proctor Test as per IS : 2720 (Part-VII). The fill material shall also be tested for determining moisture content before compaction as per IS:2720 (Part-II) For each of the above tests, one sample for every 10,000 cubic metre of fill material shall be tested. Additional samples shall be tested, whenever there is a change in the source or type of fill material. The compacted soil shall be tested for its dry density as per IS2720 (Part-XXIX) or Part-XXVIII). Samples shall be taken at the rate of one sample for every 10,000 sq.m. area for each compacted layer. In addition random checks shall be carried out in compacted soils by means of Proctor needle penetration. Bidder shall submit to the Engineer, the test results immediately after completion of the tests. A sample shall be deemed to have passed the test when the in-situ dry density is equal to or more than the specified percentage of maximum dry density. If a sample taken from a layer fails to pass the test, the layer shall be further compacted till two samples		
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	taken and tested from this layer pass without any negative deviation. Only after this. spreading of further layers shall be taken up. Before start of filling, the Bidder shall submit to the Owner his proposal for the methodology to be adopted for compaction for each type of fill material. The Bidder shall also carry out compaction trials to establish the proposed methodology. The Bidder shall start the compaction work only after approval of the methodology by the Owner The surface of the cut/filled up areas after reaching final level shall be dressed to the required levels and slopes. The difference in levels shall not be more than +/- 10cm locally. The borrow areas outside the overall plant boundary limits for obtaining suitable fill material which is required over and above the earth available after cutting high grounds within the plant area, for site levelling shall be arranged by the Bidder himself and all expenses in respect of royalties, taxes, duties, etc. for borrow areas/fill material shall be borne by him. He shall also obtain and submit to the Owner the necessary clearances/permission from the concerned authorities for the borrow areas/fill material. Material suitable for filling shall be loaded and transported to the filling site by the Bidder. Any coarse grained or fine grained low plastic soil, free from shingle, salts, organic matter, sod or any other foreign substances, may be used for filling. The Bidder shall test the fill material to establish its suitability and submit its results to the Owner. Fill material shall be approved by the Owner. The following types of materials shall not be used for filling: a) Material from swamps, marshes and bogs. b) Expansive clays c) Peat, logs, stumps, sod and perishable materials. d) Materials susceptible to combustion e) Any material or industrial and domestic produce which will adversely affect other materials in the work. f) Materials from prohibited areas Bidder shall include in his offer any extra filling that may be required on account of subsidence of the original ground due to overburden of filling above and/or compaction works for site levelling.		
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	After levelling, the contractor shall establish concrete pillars at the intersection points of the grid lines for future reference. These pillars shall project at least 450 mm above the formation level and shall be labelled permanently with their respective coordinates and reduced levels. Filling upto the specified formation level shall extend at least 2.0m beyond the outside face of boundary wall/fence. Thereafter, it shall be finished at a suitable slope (not steeper than 1 Vertical:2 Horizontal) and provided with good quality dry stone pitching minimum 300mm thick for slope upto level difference of 3m. If the level difference is more than 3m, the stone pitching shall be provided with RCC bands with suitable design and benching.				
11.00.00	FENCING Fencing with toe wall and steel gates shall be provided around the gypsum storage area , lime storage area , gypsum dewatering area , truck hopper and associated areas . Fencing shall comprise of PVC coated GI chain link fencing of minimum 8G (including PVC coating) of mesh size 75 mm and of height 2.4 m above the toe wall. The diameter of the steel wire for chain link fence (excluding PVC coating) shall not be less than 12G. All Fence posts shall be of 75 x 75 x 6 MS angles spaced at 2.5 m c/c distance. All corner posts will have two stay posts and every tenth post will have transverse stay post. Suitable R. C. C. foundation for the post and stays shall be provided based on prevailing soil conditions. Gates shall be sturdy with locking provisions. Toe walls of brick masonry shall be provided between fence posts all along the run of the fence with suitable foundation. Toe wall shall be minimum 200 mm above the formation level with 50 mm thick P. C. C. coping (1: 2. 4) and shall extend minimum 300 mm below the formation level. Toe wall shall be plastered on both sides and painted with two coats of cement paint of approved colour and shade. Toe wall shall be provided with weep holes at suitable spacing.				
12.00.00	ROADS All roads shall be of rigid pavements unless otherwise specified. The design of rigid pavement shall be carried out as per IRC: 58. The effects of design wheel load, maximum tyre inflation pressures, tyre contact area for the vehicle, traffic loads, environmental factors such as temperature changes in the pavement, other factors, like impact, load repetitions, etc., are to be taken. Detailed plate load tests to determine the modulus of sub grade reaction “K” shall be carried out as per the procedure outlined in IS: 1888. The design traffic load shall be a minimum value of 4 million standard axles. The road shall be designed for 30 years of life and considering a minimum traffic growth rate of 1 per cent per annum. The concrete pavement for roads shall be minimum 250 mm thick slab. The road construction including its shoulders, base, sub base and concrete pavement shall be as per IRC standards. IRC: 58 shall be followed for the pavement design and IRC: 15 shall be followed for the construction of the concrete pavement.				
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	The road base shall be with minimum 150 mm thick dry lean concrete over granular sub base. Dry lean concrete shall be laid by a mechanical paver and compacted by vibratory rollers. Concrete pavement of the road shall be done with fully mechanized paver fitted with electronic sensors for construction techniques. Dry lean concrete shall be minimum M10 grade and concrete pavement slab shall be minimum M35 grade concrete. The finished top (crest) of all roads shall be 350 mm above the surrounding finished ground level. The sub grade under all roads and its shoulders shall be compacted to achieve 95 per cent or more of Standard Proctor's Density MDD using mechanical means. Cutting / extending / rerouting / remaking of existing roads including associated works to maintain continuity of road system / network shall also be carried out. All culverts and RCC bridges at crossings of all roads / rail tracks / facilities with drains / nallahs / channels / roads / rail tracks / pipes / other facilities, etc. are to be designed and constructed. Unless otherwise specified, all roads shall be double lane roads.		
13.00.00	GATE ALONG BOUNDARY WALL: The gate shall be complete with fabricated hinges, MS aldrops with locking arrangement, tempered steel pivot, guide track of MS tee, bronze aluminum ball bearing, castor wheel etc. All gates shall be given anti-corrosive treatment in three coats. The structural steel shall confirm to IS: 2062 (latest) and all other relevant IS codes. Beside the each gate one room of size not less than 3m X 3m shall be provided for security guards. The room shall be made of brick/ RCC and with RCC roof. In addition to the room, one toilet block shall also be provided.		
14.00.00	LIME & GYPSUM HANDLING AND ASSOCIATED BUILDINGS STORM WATER DRAINAGE SYSTEM Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr. All RCC drains shall be either RCC Cast-in-Situ or RCC Pre-cast drains. The minimum grade of concrete shall be M25 for RCC Cast-In-Situ drains and M30 for RCC Pre-cast drains. The maximum velocity for RCC open drains shall be limited to 1.8 metre per second. However, minimum velocity of 0.6 metre per second for self - cleansing shall be ensured. Bed slope not milder than 1 in 1000 shall be provided. Open RCC rectangular section, unless required otherwise due to functioned requirement, shall be provided for all drains. The thickness of side walls and bottom slab of RCC drains shall be minimum 150mm or as per design considerations whichever is higher for drains upto depth of 1m from formation level. For depth of drain more than 1m from formation level, the thickness of side walls and bottom slab		
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15.00.00	of RCC drains shall be minimum 200mm or as per design considerations whichever is higher. The drains shall be provided on both sides of roads .These shall be designed to drain the road surface as well as all the free and covered areas, etc. Box culverts shall be provided at all rail, road and other crossings. All drains inside the building shall have minimum 40 mm thick grating covers. In areas where heavy equipment loads would be coming, precast RCC covers shall be provided in place of steel grating. The invert levels of the in-plant and plant peripheral drains shall be kept such that water can be discharged by gravity to the main / trunk drains under all conditions. The invert levels of the drains shall be decided in such a way that the water can easily be discharged to the natural water bodies above the high flood.			
	SEWERAGE SYSTEM The connection of sewer pipe line for the associated buildings of FGD and Lime and gypsum handling area to nearest owner’s sewage network is in bidder’s scope. Cement concrete pipes of class NP-3 as per IS:458 shall be used below ground level for sewage disposal in all areas . However, for pressure pipes and under roads spun C.I. pipes conforming to IS:1536 of required class shall be used. RCC manholes with CI cover shall be provided at every 30m along the length, at connection points, and at every change of alignment, gradient or diameter of a sewer pipeline. This shall be as per IS:4111. Sewage pump house shall be provided as per IS:4111.			
	LOADING			
	For consideration of loads on structures IS : 875 - ‘Code of practice for structural safety of buildings’ shall be followed. In addition to the dead load, live load, equipment load (including impact / vibration). Temperature loads etc. various loading conditions arising due to operation and maintenance of equipment shall be considered in the design. The structure and equipment shall also be designed for seismic loads as per the “Criteria for Earthquake Resistant Design of Structures and equipment” and the “Criteria for Wind Resistant Design of Structures and equipment” specified in the “Project Information section” of technical specification. Wind and seismic forces shall not be considered to act simultaneously. The following minimum live loads shall be adopted for the design of various structures. If actual expected load is more than the specified load, then actual load is to be considered.			
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	a) Roofs b) R. C. C. floors c) Stair and balconies d) Toilet rooms e) Chequered plate floors f) Walkways (including walkways in conveyor galleries) g) Conveyor galleries h) Road Culverts and its allied structures including R. C. C. pipe crossing & road crossing of trenches. i) Channels / trenches j) Covers for trenches / channels	150 Kgs. / Sq. M. for accessible roofs and 75 Kgs. / Sq. M. for non - accessible roofs. In addition to this dust load (Dead load) of 150 Kgs. / sq. m. on flat roofs & 75 Kgs. / sq. m. on inclined roofs shall also be considered. 500 Kgs. / Sq. M. 500 Kgs. / Sq. M. 200 Kgs. / Sq. M. 400 Kgs. / Sq. M. 300 Kgs. / Sq. M. In addition to the live loads, loads due to cable trays, fire fighting / service water pipes shall also be considered @ 125 Kgs. / m (minimum) on each of the longitudinal girder. Roof-truss members are to be checked for supporting fire fighting pipes/ Service water pipes. For class 'AA' loading and checked for class A loading as per IRC standard. In addition to earth pressure and water pressure, etc. additional earth pressure due to surcharge of 2T / Sq. M. shall also be considered for design. Covers for channels & trenches, shall be designed for a live load of 0.4T Sq. M. and loading as mentioned under clause in trenches, whichever is critical.	
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	k) Sumps and tanks and other underground basement type structures In addition to earth pressure with a surcharge of 2T / Sq. M. (or surcharge due to Railway loading whichever is critical for Railway load bearing structures etc.) and sub - soil water pressure etc. These are also to be designed for the following conditions : i) Water / liquid inside and no earth outside (applicable only to such structures which are liable to be filled up with water or any liquid). ii) Earth with surcharge outside and no water / liquid inside iii) For underground (basement) structures protection against buoyancy during execution and after execution shall be ensured without superimposed loadings with minimum factor of safety of 1.2 against buoyancy. If the erection load is higher than the specified live loads on any floor or part thereof, then the erection loads are to be considered for the design. Permissible increase in stresses of materials and bearing pressure of soil due to wind load or seismic load shall be as per relevant I. R. S. and I. S. code. 16.02.00 Crane load For crane loads, an impact factor of 25% and lateral crane surge of 10% (of lifted weight + trolley weight) shall be considered in the analysis of frame according to the provisions of IS:875. The longitudinal crane surge shall be 5% of the static wheel load. Longitudinal surge and lateral surge shall not be considered to act simultaneously. 16.03.00 Temperature load For temperature loading, the total temperature variation shall be considered as 2/3 of the average maximum annual variation in temperature. The average maximum annual variation in temperature for this purpose shall be taken as the difference between the mean of the daily minimum ambient temperature during the coldest month of the year and mean of daily maximum ambient temperature during the hottest month of the year. The structure shall be designed to withstand stresses due to 50% of the total temperature variation. Suitable expansion joints shall be provided in the longitudinal direction wherever necessary with provision of twin columns. The maximum distance of the expansion joint shall be as per the provisions of IS: 800 and IS: 456 for steel and concrete structures respectively. 17.00.00 DESIGN CRITERIA 17.01.00 The design of all R. C. C. structures shall be carried out as per 'code of practice for plain and reinforced concrete for general building construction', IS : 456 (latest).
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17.01.00	Design of steel structures shall be done by the Working stress method. Design shall be as per provisions of IS:800 :1984 and other relevant IS standards.		
17.02.00	Minimum size of the angle section to be used as structural members shall be 50 X 50 X 6. Minimum weld size shall be 6 mm. Connections shall be designed for 70 % of shear capacity of the member or the actual shear force, whichever is higher. The steel structures using tubular sections shall be designed and fabricated as per IS:806 – “Code of Practice for use of steel tubes in general building construction.” and EN 1993-1-8:2005. Minimum grade of steel & thickness of Tubular/Hollow sections shall be Yst 240 Mpa & 4.0mm respectively		
17.03.00	The building shall conform to local bye - laws, rules and regulations for industrial buildings and also B. I. S. publications, SP 32 and 41.		
17.04.00	Slotted holes shall not be assumed to act as expansion joint for relieving of stresses and suitable bearings shall be provided at the supports.		
17.05.00	Stresses for all structures shall be checked for the higher of the forces obtained from gust factor method and the peak wind speed method.		
17.06.00	Horizontal bracing system shall be provided at floor levels around the openings.		
17.07.00	Shear force in steel columns shall be transferred to the pedestals / foundations exclusively either through foundation bolts or the shear key arrangement.		
17.08.00	For design of liquid retaining structures, IS : 3370 (Part - I to IV) (latest) shall be followed. Face of the structure in contact with liquid shall be designed as un - cracked section. For design of R. C. C. pipes for culverts, latest editions of IS : 458, IS : 783 should be followed.		
17.09.00	For design of all underground structures / foundations, ground water table shall be assumed at the formation level (i. e. the adjoining ground level). For all underground structures like tunnel, underground transfer point and underground hopper etc. crack width shall be limited to 0.2mm.		
17.10.00	Design of masonry walls shall be made as per IS : 1905.		
17.11.00	Civil task drawing indicating various equipment loading and supporting arrangement and floor loads to be submitted along with the design calculation.		
17.12.00	Minimum 0.12% of reinforcement shall be provided on the top face of the foundation concrete on either direction and minimum percentage of reinforcement at bottom face of foundation shall be same as that stipulated for beam as per IS:456.		
17.13.00	Foundations for all tanks shall be designed for as per IS: 803.		
17.14.00	Footings shall be so proportioned to as to minimise the differential settlement.		
17.15.00	All gallery supporting trestles shall be so proportioned that the transverse deflection of gallery due to wind / seismic load should not exceed trestle height / 1000 as stipulated in IS: 11592. This deflection condition shall be strictly followed. Peak wind speed method shall be considered for checking the transverse deflection.		
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17.16.00	The crusher and transfer house structures shall be so designed that transverse deflection at places where conveyor galleries meet, should be equal to the respective transverse deflection of conveyor supporting trestles.											
17.17.00	Deflection criteria The maximum Horizontal Deflection for various structures shall not exceed and be limited to the following: <table><tr><th>Sl. No.</th><th>Description</th><th>Maximum value of</th></tr><tr><td>1.</td><td>For Trestles and transfer points (Transverse deflection at Conveyor gallery supporting level)</td><td>Height/1000 (For Wind load by Peak Wind Speed Method / Seismic Load)</td></tr><tr><td>2.</td><td>For other Buildings</td><td>Height/325</td></tr></table>			Sl. No.	Description	Maximum value of	1.	For Trestles and transfer points (Transverse deflection at Conveyor gallery supporting level)	Height/1000 (For Wind load by Peak Wind Speed Method / Seismic Load)	2.	For other Buildings	Height/325
Sl. No.	Description	Maximum value of										
1.	For Trestles and transfer points (Transverse deflection at Conveyor gallery supporting level)	Height/1000 (For Wind load by Peak Wind Speed Method / Seismic Load)										
2.	For other Buildings	Height/325										
17.18.00	a) Permissible deflection (unless specified otherwise in this specification) for latticed framework and beams of floors other than drive floor shall be span/325. b) The allowable deflection for beams directly supporting drive machinery shall be restricted to span/500 unless specified otherwise in this specification. c) The deflection for manually operated cranes & monorail supporting beams shall not exceed span/500. For electric overhead cranes : 1) upto 50 t capacity : span/750 2) over 50 t capacity : span/1000 d) The vertical deflection of metal deck sheet for roofing and side cladding shall be limited to span/250 e) The permissible vertical deflection for beams supporting drive machinery shall be restricted to span / 500 and for other beams it shall be within span / 325. f) Permissible deflection for all purlins, cladding runners, roofing/cladding sheets and grating / chequered plates shall be span/250. However, the maximum vertical deflection of Grating/ Chequered plate shall be limited to 6 mm.											
17.19.00	a) Dispersion of load in any direction through soil shall be as per IS: 8009 (relevant part). b) Dispersion of load through concrete shall be considered at an angle of 45 degrees with horizontal from the edge of contact area.											
17.20.00	a) The design and construction of RCC structures shall be carried out as per IS: 456. Working stress method shall be adopted for the design wherever											
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17.21.00	specifically mentioned in this specification.						
	b) For design and construction of steel-concrete composite members, IS: 11384 shall be followed.						
	c) For reinforcement detailing, IS: 5525 and SP: 34 shall be followed.						
	d) Two layers of reinforcement (on both inner and outer faces) shall be provided for RCC wall sections having thickness 150 mm or more.						
	a) All RCC liquid retaining/conveying shall be designed by working stress method as outlined in clause no. 4.5 of IS 3370 (Part-2) 2009 unless specified other wise.						
17.22.00	b) Water proofing treatment shall be provided for liquid retaining/ carrying structures and basement type structures (requiring dry working condition). Dense and durable concrete with water cement ratio not more than 0.45 shall be used. Plasticiser /super-plasticiser cum water proofing compound shall be added to the concrete. All the construction/expansion joints shall be provided with PVC water bar and/or chemical injection grouting as per IS:6494. As applicable internal/external surface of such structures shall be provided with acrylic based polymer modified cementitious composite coating system for critical structures. For liquid carrying/retaining structures, minimum two coats of such coating shall be applied. For external application wherever the surface is in contact with the earth, fine silica/quartz sand of 0.6 mm nominal size shall be added in the coating mix for better abrasion resistance and total nominal thickness of such coating shall be minimum 1.5 mm. For non critical structures minimum two coats of bitumen grade 85/25 as per IS:702, mixed with 1% of anti-stripping compound meeting the requirement of IS:6241, shall be applied. The total application of bitumen shall not be less than 1.7 kg/sq.m.						
	Bidder shall submit a comprehensive scheme for water proofing treatment based on above or any other alternative scheme, internationally accepted for Employer's approval prior to commencement of work.						
	c) All liquid retaining/carrying structures shall be tested for water tightness as per the provisions of IS: 3370 and IS: 6494 and in case of leakage, the same shall be rectified by chemical injection grouting through nozzles.						
17.23.00	For design of all underground structures, foundations, etc. ground water table shall be assumed at the finished ground level unless specified otherwise.						
17.24.00	Earth pressure for all underground structures shall be calculated using coefficient of earth pressure at rest or co-efficient of active earth pressure, whichever is applicable, depending upon the structural configuration. However, for the design of substructure of pump houses, earth pressure at rest shall be considered. Co-efficient of passive earth pressure shall be used only in design of shear keys for stability against sliding.						
17.24.00	a) Following loading conditions shall be considered in addition to the loading from super structure for the design of substructure of pump house, channels, sumps, tanks, trenches and other underground structures containing liquid						
	i) Water pressure from inside and no outside pressure, like earth pressure, ground water and surcharge pressure (applicable only to structures, which are liable to be filled up with water or any other liquid.)						
	ii) Earth pressure, surcharge pressure and ground water pressure from outside and no water pressure from inside.						
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	Coating on RCC water retaining structures (drinking water) Internal surfaces of RCC water retaining structures shall be provided with minimum 400 micron Food grade epoxy coating complying to FDA Title 21, Part 175.300. Surface to be coated shall be absolutely dry, clean and dust free			
19.00.00	Fabrication All steel structures shall be fabricated in factory, transported and erected at site. All factory fabricated structures shall have bolted field connections. Chimney flue liners can either be fabricated at factory in segments, transported and welded at site before erection or fabricated at site. For Chimney flue liners, to prevent flue gas leakages, the applicable field joints shall necessarily be welded.			
20.00.00	Electrodes			
20.01.00	The electrodes used for welding shall be of suitable type and size depending upon specifications of the parent material, the method of welding, the position of welding and quality of welds desired. Only low hydrogen electrodes shall be used for welding of medium /high tensile steel and for mild steel plate thickness above 20 mm.			
20.02.00	All low hydrogen electrodes shall be baked and stored before use as per manufacturer's recommendation. The electrodes shall be re-baked at 250°C - 300°C for one hour and later on cooled in the same oven to 100° C. It shall be transferred to a holding oven maintained at 60°C - 70°C. The electrodes shall be drawn from this oven for use.			
20.03.00	Where coated electrodes are used they shall meet the requirements of IS: 814 and relevant ASME - Sec. II. Covering shall be heavy to withstand normal conditions of handling and storage.			
20.04.00	Only those electrodes that give radiographic quality welds shall be used for welds, which are subjected to radiographic testing.			
20.05.00	Where bare electrodes are used these shall correspond to specification of the parent material. The type of flux-wire combination for submerged arc welding shall conform to the requirements of F-60 class of AWSA-5-17-69 and IS: 3613. The electrodes shall be stored properly and the flux shall be baked before use in an oven in accordance with the manufacturer's requirements as stipulated.			
20.06.00	The contractor shall take specific approval of the weld for the various electrodes proposed to be used on the works before any welding is started.			
20.07.00	Edge Preparation for Welding Suitable edge as per weld joint detail shall be prepared either by machines or by automatic gas cutting. All edges cut by flame shall be ground before they are welded.			
20.08.00	Pre Heating and Post Heating Mild steel and medium / high tensile steel plates thicker than 20mm, will require Pre-Heating of the parent plate prior to welding as mentioned in Table - 1 for mild steel and Table - 2 for medium / high tensile steel, however, higher pre heat temperature			
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	may be required as per approved welding procedure and it shall be followed. In welding materials of unequal thickness, the thicker part shall be taken for this purpose. Base metal shall be preheated, notwithstanding provisions of IS: 9595 to the temperature given in Table - 1 for mild steel and Table - 2 for medium / high tensile steel, prior to welding or tack welding. When base metal not otherwise required to be pre heated is at a temperature below 0°C it shall be pre heated to atleast 20°C., prior to tack welding or welding. Pre heating shall bring the surface of the base metal to the specified pre heat and this temperature shall be maintained as minimum inter-pass temperature welding is in progress. TABLE - 1 MINIMUM PREHEAT AND INTERPASS TEMPERATURE FOR WELDING MILD STEEL <table><tr><th rowspan="2">Thickness of thicker part at Point of welding</th><th colspan="2">Welding Using</th></tr><tr><th>Low hydrogen electrode or submerged arc welding</th><th>Other than low hydrogen electrode</th></tr><tr><td>Upto and including 20mm</td><td>None</td><td>None</td></tr><tr><td>Over 20mm and up to and including 40mm</td><td>20°C</td><td>Not allowed</td></tr><tr><td>Over 40mm and up to and including 63mm</td><td>66°C</td><td>Not allowed</td></tr><tr><td>Over 63mm</td><td>110°C</td><td>Not allowed</td></tr></table> Note: Type of electrode and the preheating requirements for welding shall be as per approved welding procedure. TABLE - 2 MINIMUM PREHEAT AND INTERPASS TEMPERATURE FOR WELDING MEDIUM / HIGH TENSILE STEEL <table><tr><th rowspan="2">Thickness of thicker part at Point of welding</th><th colspan="2">Welding Using</th></tr><tr><th>Low hydrogen electrode or submerged arc welding</th><th>Other than low hydrogen electrode</th></tr><tr><td>Upto and including 20mm</td><td>None</td><td>Not Allowed</td></tr><tr><td>Over 20mm</td><td>120oC - 140°C</td><td>Not Allowed</td></tr></table> Note : Type of electrode and the preheating requirements for welding of medium and high tensile steel shall be as per approved welding procedure.	Thickness of thicker part at Point of welding	Welding Using		Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode	Upto and including 20mm	None	None	Over 20mm and up to and including 40mm	20°C	Not allowed	Over 40mm and up to and including 63mm	66°C	Not allowed	Over 63mm	110°C	Not allowed	Thickness of thicker part at Point of welding	Welding Using		Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode	Upto and including 20mm	None	Not Allowed	Over 20mm	120oC - 140°C	Not Allowed
Thickness of thicker part at Point of welding	Welding Using																												
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Over 20mm and up to and including 40mm	20°C	Not allowed																											
Over 40mm and up to and including 63mm	66°C	Not allowed																											
Over 63mm	110°C	Not allowed																											
Thickness of thicker part at Point of welding	Welding Using																												
	Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode																											
Upto and including 20mm	None	Not Allowed																											
Over 20mm	120oC - 140°C	Not Allowed																											
20.09.00	Pre heating may be applied by external flame which is non-carbonizing like LPG, by electric resistance or electric induction process such that uniform heating of the																												
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	surface extending up to a distance of four times the thickness of the plate on either side of the welded joint is obtained.			
20.10.00	Thermo-chalk, thermo-couple or other approved methods shall be used for measuring the plate temperature.			
20.11.00	All butt welds with plates thicker than 50mm and all site butt welds of main framing beam supporting the bunker shall require post weld heat treatment as per procedure given in AWS D-1.1. Post heating shall be done up to 600oC and rate of application shall be 200oC per hour.			
20.12.00	The post heat temperature shall be maintained for 60 minutes per 2.5cm thickness. For maintaining slow and uniform cooling, asbestos pads shall be used for covering the heated areas.			
21.00.00	Paving, Drainage and Sewage RCC paving of minimum 150 mm thick with M25 grade concrete, over an underbed as specified herein shall be provided. RCC paving shall be designed as rigid reinforced concrete pavement for the crane/ vehicular/ equipment movement loads which the paving has to bear. The under bed for paving shall consist of preparation and consolidation of sub-grade to the required level, laying of stone soling of 200mm compacted thick for normal duty paving with 63 mm and down aggregate with interstices filled with selected moorum followed by 75 mm thick 1:4:8 PCC (1 part cement, 4 parts sand and 8 parts stone aggregate) with 40 mm nominal size aggregate. Paving areas shall be provided with the metallic hardener floor finish as specified elsewhere in the specification. 2.5 m wide paving with metallic hardener around periphery of all sumps and underground tanks shall be provided. Suitable drains shall be provided to dispose off storm water as well as floor wash of the FGD area block. The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain. Sewer lines (Cast Iron), interconnected by sewer manholes (RCC) at regular intervals (not exceeding 30 meter centre to centre) shall be provided to dispose off sewage from FGD area to the nearest available manhole of the owner. The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr. The maximum velocity for pipe drains and open drains shall be limited to 2.4m/sec and 1.8 m/sec. respectively. However, minimum velocity of 0.6m/sec. for self-cleansing shall be ensured. Bed slope not milder than 1 in 1000 shall be provided. The open drains shall be open rectangular drains of RCC unless required otherwise due to functional requirement. RC box culverts shall be provided at rail, road or other crossings. Sewers shall be designed for a minimum self-cleansing velocity of 0.75m/sec and the maximum velocity shall not exceed 2.4m/sec.			
22.00.00	Statutory Requirements Bidder shall comply with all the applicable statutory rules pertaining to Factories Act, Fire Safety Rules at Tariff Advisory Committee. Water Act for pollution control, Explosives Act, etc.			
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23.00.00	Provisions of safety, health and welfare according to Factories Act shall be complied with. These shall include provision of continuous walkways along the crane - girder level on both sides of building, comfortable approach to EOT crane cabin, railing, fire escape, locker room for workmen, pantry, toilets, rest room etc. Provisions for fire proof doors, number of staircases, fire separation wall, lath plastering/encasing the structural members (in fire prone areas), type of glazing etc. shall be made according to the recommendations of Tariff Advisory Committee. Statutory clearances and norms of State Pollution Control Board shall be followed. Bidder shall obtain approval of Civil/Architectural drawings from concerned authorities before taking up the construction work. INSPECTION, TESTING AND QUALITY CONTROL Sampling and testing of major items of civil works viz. earthwork, concreting, structural steel work (including welding), piling, sheeting, etc. shall be carried out in accordance with the requirements of this specification. Wherever nothing is specified relevant Indian Standards shall be followed. In absence of Indian Standard equivalent International Standards may be used. The Bidder shall submit and finalise a detailed field Quality Assurance Programme before starting of the construction work according to the requirement of this specification. This shall include frequency of sampling and testing, nature/type of test, method of test, setting of a testing laboratory, arrangement of testing apparatus/equipment, deployment of qualified/experienced manpower, preparation of format for record, Field Quality Plan, etc. Tests shall be done in the field and/or at a laboratory approved by the Engineer. The Bidder shall furnish the test certificate from the manufacturer's of various materials to be used in the construction. 24.00.00 CONCRETE All R. C. C. works to be done under this specification, unless specified otherwise shall be design mix concrete. Minimum grade of concrete for various structures shall be as follows: a) M25 - For all underground / sub-structural/ super-structure R. C. C. work. b) M30- For Block Foundation c) M35- For spring supported RCC deck Minimum 75 mm thick P.C.C M-7.5 shall be provided as mud mat below all foundations. For concreting of underground structures requiring water tightness, plasticizer cum water proofing admixture shall be added to the concrete mix. Both coarse and fine aggregates shall conform to IS: 383 for concrete, shotcreting etc. unless otherwise mentioned.
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25.00.00	Excavation, Backfilling, Disposal and Stacking of materials Details		
25.01.00	Excavation in Soil Excavation for foundation shall be to the bottom of lean concrete and as shown on drawing or as directed by the Engineer. The bottom of all excavations shall be trimmed to required levels and when excavation is carried below such levels by error, it shall be brought back to the specified level by filling with concrete of nominal mix 1 : 3 : 6 (cement: coarse sand: 40 mm down aggregates), as directed by the Engineer. The Contractor shall ascertain for himself the nature of materials to be excavated and the difficulties, if any, likely to be encountered in executing this work. Cofferdams, sheet piling, shoring, bracing to maintain suitable slopes, draining etc. shall be provided and installed by the contractor, to the satisfaction of the Engineer. Surplus excavated materials shall be disposed off by the contractor at locations up to a lead of 5 kms from the plant boundary wall as directed by the engineer. The Contractor shall have to constantly pump out any water collected in excavated pits and other areas due to rain water, springs etc. and maintain dry working conditions at all times until the excavation, placement of reinforcement, shuttering, concreting, Backfilling is completed. The Contractor shall remove all slush/muck from the excavated areas to keep the work area dry. The Contractor, if required, shall employ sludge pumps, for this purpose. For other details, excavation clauses as given at “Foundation system and Geotechnical Data Chapter” given at “Project Information section” of technical specification, are to be referred.		
25.02.00	Excavation in Rock For the work of excavation in rock, Contractor shall engage specialised agency having experience of excavation in rock involving wedging and blasting. The agency shall be subject to approval of Engineer and the Contractor shall furnish details of relevant experience in support while seeking approval for the agency. Blasting shall be resorted to only with the written permission of the Engineer. All the statutory laws, (Explosives Act etc.) rules, regulations, Indian Standards etc. pertaining to the acquisition, transport, storage, handling and use of explosives etc. shall be strictly followed. The contractor shall obtain Licenses from Competent Authorities for undertaking blasting work as well as for procuring, transporting to site and storing the explosives as per Explosives Act. The Contractor shall be responsible for the safe transport, use, custody and proper accounting of the explosive materials. Surplus excavated materials shall be disposed off by the contractor at locations up to a lead of 5 kms from the plant boundary wall as directed by the engineer. The Contractor shall have to constantly pump out any water collected in excavated pits and other areas due to rain water, springs etc. and maintain dry working conditions at all times until the excavation, placement of reinforcement, shuttering, concreting, backfilling is completed. For other details for excavation in rock, clauses as given at		
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25.03.00	“Foundation system and Geotechnical Data Chapter” given at “Project Information section” of Technical specification, are to be referred. Backfilling, Disposal and Stacking of materials Backfilled earth shall be compacted as per “Foundation system and Geotechnical Data Chapter” given at “Project Information section” of technical specification. However, the backfill under the rail lines and roads shall be compacted to minimum 95 % of the standard proctor density at OMC unless otherwise stated by rail Authorities. The contractor is required to excavate upto any depth as shown on the drawings or as directed by the Engineer. Lifting of excavated materials shall be done either by manual or mechanical or both means if called for by the Engineer. The disposal / stacking areas for excavated materials shall be indicated by the Engineer. The carriage of excavated materials shall be done by the methods mentioned below: The excavated materials shall be carried beyond the initial lead of 50 m but upto 500 m by manual / animal labour or by mechanical means. If directed by the Engineer this material shall be used directly for filling purposes. For leads exceeding 500 m the Contractor shall transport the excavated materials by mechanical means only and as directed by the Engineer. The Contractor may be allowed to carry materials through Kuccha roads. Providing and maintaining of the Kuccha roads shall be the responsibility of the Contractor. The transported material shall be neatly stacked as directed by the Engineer. Some excavated materials required for filling purposes, may have to be carried upto a lead of 500 m and stacked as per instructions of the Engineer. Excavated materials carried beyond 500 m shall normally be for disposal purpose only. Double handling of materials shall be avoided as far as possible. However, depending on site condition excavated materials carried beyond a lead of 500 m may also be required to be brought back for filling purpose. Materials to be used for filling purpose shall be stone, sand or other inorganic materials and they shall be clean and free from shingle, salts, organic matter, large roots and excessive amount of sod, lumps, concrete or any other foreign substances which could harm or impair the strength of the substances in any manner. All clods shall be suitably broken to small pieces. When the material is mostly rock boulders, these shall be broken into pieces not larger than 150 mm size before backfilling and shall be backfilled in layers of 300mm interstices filled with sand. In case of broken rock boulders used for back filling, the top cover shall be with 1.0m thick soil. The layers of rock boulders, interstices filled with sand shall be compacted by plate vibrators. Sand used for filling shall be clean, medium grained and free from impurities. Fines less than 75 microns shall not be more than 20%. In any case, the materials to be used for filling purposes shall have the prior written approval of the Engineer.		
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26.00.00	In case the materials have to be brought from pits / quarries, then it shall be the Contractor's responsibility for identification of such quarry areas, obtaining approval from their use from concerned authorities, excavation / quarrying loading and carriage of such material, unloading and filling at specified locations. The Contractor shall pay any fees, royalties etc. that may have to be paid for utilisation of borrow areas.			
	GALVANISING All burrs and irregular edges of the structural steel members to be galvanised shall be ground smooth before galvanising. Purity of Zinc to be used for galvanising shall be 99.5 % as per IS : 209 (latest edition). The weight of the zinc coating shall be at least 610 Gms. / m² unless noted otherwise.			
27.00.00	CHEMICAL INJECTION GROUTING Minimum, 12 mm dia (NB) threaded nozzle of suitable length, shall be provided over the surface and along the construction joint line in a grid pattern at a spacing not exceeding 1.5 m c / c before concreting operation. Adequate precaution shall be taken to keep the nozzles plugged at both ends to prevent them from getting closed by concrete. For fixing of any nozzle in set concrete suitable size hole shall be drilled, preferably by using percussive hammer drill electrically operated, in grid pattern and grouting nozzle shall be fixed in these holes. After the nozzles are fully set, neat cement slurry admixed with water soluble non - shrink polymer / monomer based chemical shall be injected through the net - work of nozzles with low pressure grout pumps at a pressure of about 2.0 Kgs. / cm². Cement slurry shall be prepared by mixing cement with non-shrink polymer/monomer @ 500 gm/50 kg bag of cement and water, ensuring that Water: Cement ratio does not exceed 2 (by weight). Wetter the structure, lesser should be the water cement ratio. The property of the polymer/monomer should be such that when it is mixed with water @0.5% by weight of water, the viscosity of the resultant solution (water and polymer/monomer) should not be more than 1.2 centipoises. Plasticizing agent shall be added wherever required. The grouting shall be started at very low pressure and increased gradually to a required pressure. The grouting shall continue, till the hole refuses to take any further grout, even at an increased pressure. Applied pressure shall not be more than the designed strength of the concrete. After completion of grouting operation, the nozzles shall be sealed properly to the satisfaction of the Engineer.			
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28.00.00 28.01.00 28.02.00 28.03.00 28.04.00	POLYMER MODIFIED CEMENTITIOUS COATING Materials Modified liquid polymer blend shall be a dispersion containing 100 % acrylic based polymer solids. Polymer shall be mixed in the ratio of 1 cement: 0.5 polymer (for minimum solid content of polymer 30%). Portland cement based dry powder. Clean, fine specially prepared quartz sand approximately 0.6 mm size. Mixing The liquid polymer shall be stirred well and cement based powder shall then be added slowly to make a Slurry Mix. For preparation of Brush Topping Mix, quartz sand shall be added slowly and mixed well till a homogeneous mixture is obtained. The mix shall be used within half an hour of the preparation. Addition of quartz sand may not be necessary, in case dry power contains the same. Properties of Coating It must adhere to wet surface. It should develop adequate bond strength, with the concrete surface, not less than 2 N / Sq. mm. Co - efficient of permeability shall be about 5×10^{-10} Cm / Sec. Water absorption after continuous soaking shall not be more than 1 %. The materials shall be permeable under water vapour. The material shall be resistant to acids and alkalies present in the soil and underground water with normal pH value between 4 and 14. The co - efficient of thermal expansion of the material shall be close to that of concrete. Application The concrete surface shall be cleaned and made free from grease, oils or loosely adhered particles. The surface shall be damp without any free water. For exterior underground part, application (b) pertaining to Brush topping Mix shall be followed. (a) For Slurry Mix A minimum of 2 coats shall be applied on the surface. The first coat being applied, when the surface is still damp and left to harden for 4 to 6 hours. After 4 to 6 hours of the application of second coat, it shall be finished by rubbing down with a soft dry
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	sponge. The coverage shall not be less than 1 : 1 Kgs. / m² in the 2 coats. A lap of 75 mm shall be provided at the joints. The coating shall be air dried for 4 to 6 hours and, thereafter, cured for 7 days after the application of last coat. (b) For Brush Topping Mix This shall be applied in two coats. A primary coat of slurry mix can also be first applied on the surface as first coat. After the coating has dried up, a coat of Brush Topping Mix shall be applied over it with a push broom or any other similar brush. It shall be left in broom finished condition. The nominal thickness shall be 1.5 mm and minimum thickness shall be 1.0 mm. A lap of 75 mm shall be provided at the joints. It shall be ensured that no pinhole exists and rebrushing shall be done to cover the pinholes, if any. The Coating shall be air dried for 4 to 6 hours and thereafter cured for 7 days after the application of last coat. Rate of application of coating shall be established to achieve the required thickness.
29.00.00	Architectural Concepts Buildings shall be architecturally treated in such a way that it presents a pleasing composition of mass and void with suitable and functionally designed projections and recesses. The overall impact of the building shall be one of aesthetically unified architectural composition having a comprehensive scale, blending with the surroundings and taking full consideration of the climatic conditions and the building orientation. All the buildings shall be architecturally treated in such a way so as to be in harmony with the surroundings. The over all composition may have straight or curvilinear profiles. Necessary projections, fins, parapets, chajjas etc. in addition to the minimum area specified elsewhere in this specification shall be provided as required. Nothing extra shall be payable for any changes required while getting the drawings / scheme approved and for executing the same. All structures, buildings and facilities shall be designed as per provisions of National Building Code 2005 and Local building by - laws as applicable including provisions of the Factories Act of the State concerned, with regard to requirement of free access, stairs, minimum head room, walkways, ventilation, toilets etc. and safety requirements like railings, fire escapes etc. Further all layouts and detailed drawings shall meet the relevant statutory requirements specified in recommendations of Petroleum act, Explosives act and Indian Electricity rules' as applicable.
29.01.00	FINISHING SCHEDULE
29.01.01	Flooring The nominal total thickness of floor finish shall be 50mm i.e. underbed & topping. The floor shall be laid on an already laid and matured concrete base.
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29.01.02	Flooring of tiles / stone shall be fixed with 18 mm thk cement sand mortar 1:4, above PCC under bed (M 20 (with graded aggregate of nominal size 12.5mm) design mix)		
	Flooring of Concrete hardener topping shall be provided above the PCC underbed (M 20 (with graded aggregate of nominal size 12.5mm) design mix).		
29.02.00	Wherever specified Heavy duty ceramic tiles of size 300x300x7 mm thick (minimum) of reputed manufacturer (Kajaria, Orient, Johnson or equivalent) of approved finish shade and colour to be used. Vitrified ceramic tiles wherever specified shall be 600x600 mm with minimum 9.5 mm thickness and of reputed manufacturer (Kajaria, Johnson, Orient or equivalent).		
	Floor finish & skirting: The nominal thickness of floor finish shall be 50 mm. Floors of toilets, pantries / kitchen shall be finished with Heavy duty (grade-5) dust pressed ceramic tiles 300mmx300mm x7 mm thick as per IS:15622, including pointing the joints with white cement mixed with matching pigment, of approved make, size & colour shade. (1) Floors of Office Room, Labs, Control Rooms, RIO Rooms and all other A/c Room shall be finished with Mirror polished Vitrified ceramic tiles (minimum 9.5 mm thk) with 3 mm groove joints as per approved pattern, pointed neatly with 3X4mm stainless epoxy grout SP- 100 of Laticrete or approved equivalent in approved colour to match colour of tile. (2) Suitable supporting arrangement shall be provided with M.S. angles / channels on cable trenches in MCC and Control rooms for mounting Control panels / MCC. (3) In rest of the areas, IPS (Cement concrete flooring) with Concrete hardener topping shall be 12mm thick with ordinary grey cement using uniformly graded, properly treated iron particles shall be provided. (4) Floors and sides of under ground RCC structures like valve pits, trenches and tanks shall have simultaneous (integral) neat cement finish at the time of concreting. (5) The interconnecting walkway between various structures, buildings and facilities shall be finished with 22 mm chequered concrete tiles at top. 1000 mm wide walkway of 22mm thick chequered concrete tiles shall be provided on terrace for maintenance purpose, in all RCC /Metal deck roof buildings. (6) Skirting in general shall be 150mm high, Dado in toilet, kitchen & pantry shall be up to specified height (up to 2200 mm for toilets, up to 600 mm high above counter top in kitchen and pantry area). The dado height shall be measured from finished floor level. Skirting and Dado shall match with the floor finish. (7) Battery Room shall be provided with Acid resistant tile on horizontal and vertical surfaces, at all levels for all type of works, including One coat of bitumen primer followed by 12 mm thick bituminastic layer, 20 mm thick Acid Resistant tiles, 6 mm thick under-bed by potassium silicate mortar, 6 mm thick pointing of joints of tiles with acid/alkali resistant epoxy/furane mortar up		
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	to a depth of 20 mm and bituminastic end sealing. 1200 mm high dado on wall shall be with 12 mm thk Acid resistant tiles of the similar finish and the joints to be finished as per flooring tiles, with the rest of wall height and ceiling finished in chemical resistant paint (chlorinated rubber based). (8) Well polished 18 mm thick Kota stone jointed with neat cement slurry mixed with pigment to match the shade of the stone including rubbing and cleaning, complete, to be provided in entrance area, entrance steps, Entrance area, staircases (tread, riser, landings, skirting).		
29.03.00	Sunken RCC slab shall be provided in false flooring area and toilet, Kitchen and pantry, so as to keep the finished floor level of these areas same as that of the surrounding area.		
29.04.00	Water proofing treatment to be provided on sunken portion of all vertical and horizontal surfaces of depressed portions of all toilets, W.C., kitchen, Pantry and the like consisting of : (i) Ist course of applying cement slurry @ 4.4 kg/sq.m mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. (ii) IInd course of 20 mm cement plaster 1:3 (1 cement: 3 coarse sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. (iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sq.m of area. (iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sq.m).		
29.05.00	Acid / Alkali Resistant Treatment: Acid / alkali resistant lining treatment shall be provided in different areas as follows: Neutralization Pit: The walls shall be provided with one coat of bitumen primer, followed by 18 mm thick bitumastic layer, 115 mm thick A.R. bricks, 6 mm thick under bed of potassium silicate mortar, pointing the joints of bricks with acid / alkali resistant epoxy / furane mortar upto a depth of 20 mm and bitumastic end sealing. Suitable plasters shall be provided with A.R. bricks at regular intervals depending upon the height of lining, as per the specification. The floor of neutralization pit shall be provided with acid / alkali resistant lining treatment as given in the above para, except that the 115 mm thick A.R.tile layer shall be replaced by 75 mm thick A.R. tile layer and pilasters shall be omitted. The ceiling of neutralization pit shall be provided with one coat of epoxy primer followed by 2 coats of epoxy paint (150 micron). Acid / Alkali storage area / projections above the floor, pedestals projecting from the floor / saddles. : The floor shall be provided with one coat of bitumen primer followed		
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	by 12 mm thick bitumastic layer, 20 mm thick A.R. tiles, 6 mm thick under - bed by potassium silicate mortar, 6mm thick pointing of joints of tiles with acid / alkali resistant epoxy / furane mortar up to a depth of 20 mm and bitumastic end sealing. Dado of 12 mm thk Acid Resistant tiles up to 1.0M high shall also be provided if applicable in case of walls nearby. Alum/Lime Storage area and first floor of Chemical House : One coat of bitumen primer followed by 12mm thick bitumastic layer, 20 mm thick A.R. tiles, 6 mm thick underbed of potassium silicate mortar, 6mm thick pointing of joints of tiles with acid /alkali resistant epoxy /furane mortar up to a depth of 20 mm and bitumastic end sealing. Alum solution preparation tank: The wall shall be provided with one coat of bitumen primer followed by 12 mm thick bitumastic layer, 75 mm thick A.R. tiles, 6 mm thick underbed by potassium silicate mortar, pointing of joints of tiles with acid / alkali resistant epoxy / furane mortar upto a depth of 20 mm and bitumastic end sealing. The floor shall be provided with acid / alkali resistant lining treatment as given in the above para except that the 75 mm thick A.R. tile layer shall be replaced by 12 mm thick A.R. tile layer. Basket of Alum solution preparation tank: 5 mm thick epoxy lining over a coat of epoxy primer. Curved surfaces of saddles shall have minimum 12 MM thick bitumastic layer to support the vessel / tanks. Effluent Drains: Acid Resistant lining treatment indicated for the storage area shall be provided on the bed as well as walls of the drains with 38 MM AR tiles. The underside of the pre-cast slab cover shall be applied with one coat of epoxy primer and two coats of epoxy coating, total DFT 150 microns. Lime tank: Two coats of bitumen paint conforming to IS: 9862, with total DFT 150 microns.
29.06.00	Walls
29.06.01	All walls shall be non-load bearing infilled panel walls. All external walls shall be minimum one brick thick masonry wall.
29.06.02	All external and internal walls shall be with minimum one brick masonry (230 or 250 mm) including toilet walls. Toilet partition low height walls shall be minimum half brick masonry.
29.06.03	For all air conditioned areas/ rooms, wherever metal cladding is envisaged as cladding material, additional brick masonry wall (230mm thick) shall also be provided in addition to metal cladding for effective air conditioning. This brick wall shall be plastered & painted as specified elsewhere in the specification.
29.06.04	RCC transoms and mullions of size 115x115mm with suitable reinforcement shall be provided wherever necessary to reinforce the brickwork.
29.06.05	50 mm thick DPC in Cement concrete (M-20) with water proofing compound followed by two layers of bitumen coating 85/ 25 grade as per IS: 702 @ 1.7 kg/ sq.m. shall be provided at plinth level before starting the masonry work.
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29.06.06	The bricks shall be laid with cement mortar (1:6) for one brick thick walls and (1:4) for half brick thick walls IS: 1905, IS: 2212 and SP -- 20 shall be followed for brick work design and construction.		
29.07.00	Plastering		
29.07.01	External (rough) surface of walls shall be plastered with 18 mm thick cement plaster, consisting first (base) layer of 12 mm thick plaster in cement sand mortar (1:6) and second (finishing) layer of 6 mm thick plaster in cement sand mortar (1:4). The internal (smooth) surface of walls shall have 12 mm thick plaster in cement sand mortar (1:6). All external / internal RCC surfaces including RCC parapet walls shall be provided with minimum 12mm thick plaster in cement sand mortar (1:4) except walls of underground structures like cable trenches / valve pits etc.		
29.07.02	All exposed faces of R.C.C. walls of structures, buildings and facilities shall have minimum 12 mm thick cement sand plaster 1:6.		
29.07.03	All RCC ceilings (except areas provided with false ceilings and cable vault ceiling) shall be provided with 6 mm thick cement sand plaster 1:4.		
29.07.04	All plastering work shall conform to IS: 1661.		
29.08.00	Painting		
29.08.01	All painting on masonry or concrete surface shall preferably be applied by roller. If Applied by brush then same shall be finished off with roller.		
29.08.02	All paints shall be of approved make including chemical resistant chlorinated rubber paint.		
29.08.03	Minimum two finishing coats of paint shall be applied over a coat of primer.		
29.08.04	The thinner shall not be used with textured paint (Sandtex Matt or equivalent) finish.		
29.09.00	Internal Finish		
	All Air conditioned areas shall have 2mm of polymer based water resistant putty (wall putty) to given an even and smooth surface.		
29.09.01	Acrylic emulsion paint shall be as per IS: 5411 (Part - 1). Acrylic distemper shall be as per IS: 428. Air - conditioned areas shall be applied with minimum 2 coats of acrylic emulsion paint. All other areas shall be applied with minimum 2 coats of Acrylic distemper.		
29.09.02	Toilet, Pantry / Kitchen areas shall have dado with Designer ceramic tiles, 300x200mw (matt finish) upto 2.2 m height and shall match with floor finish. Above dado, Acrylic distemper shall be applied.		
29.09.03	Areas coming in contact with chlorine fumes or acid / alkali shall have two coats of acid / alkali resistant chlorinated rubber paint over suitable primer on walls above dado & ceiling. The paint shall be of approved colour shade and make.		
29.10.00	External Wall Finish		
	One pack, ready mix and ready to use, resin / polymer bonded granular textured coating finish of 2.5 mm (natural coloured graded stone chips), of approved colour, and shade for all types of plastered and / or exposed concrete surface, in all kinds of works, at all levels, including preparation of surface, preparation of working drawing,		
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	labour, material, equipment, handling, transportation, mixing, laying, applying finishing, testing, curing, making grooves, scaffolding, staging, etc., all complete, as per specifications, drawings and instructions of the Engineer-in-charge. Toe wall of chain link fencing shall be provided with two coats of Acrylic Smooth Exterior Paint The finish shall be of approved colour shade and make.			
29.11.00	Ceiling Finish			
	Ceiling shall have min. two (2) coats of Acrylic distemper except AC areas & Battery room.			
29.11.01	For painting on concrete, masonry and plastered & surface, IS: 2395 shall be followed. For painting on steel work and ferrous metals, IS: 1477 shall be followed.			
29.11.02	Fire resistant transparent paint (confirming to IS: 162) shall be provided on all wood work, over French police or flat oil paint. French polish shall confirm to IS : 348. Flat oil paint shall confirm to IS: 1237.			
29.12.00	Doors, Windows, Ventilators, Louvers, Rolling Shutters & Glazing			
29.12.01	Adequate Doors, Windows, Louvers and Ventilators shall be provided for proper lighting and ventilation of all buildings. The area of windows shall be at least 10% of the floor area of the respective building. In addition to the above, wherever room height is more than 3.5 m, a band of ventilators of 600 mm height (minimum) shall be provided at the top.			
29.12.02	Unless specified all doors, of air conditioned areas, entrance lobby of all buildings shall have electro colour coated (anodised) aluminium frame work with glazing. Windows, ventilators & partitions of all buildings shall have electro colour coated (anodised) aluminium frame work with glazing. All doors of toilet, kitchen, pantry & store areas shall be of factory made pre - laminated solid core flush door shutters, as per IS: 2202 (Part-II) with pressed steel door frame. Control room shall have Aluminium glazed door & partitions. All other doors (unless otherwise specified) shall be of steel.			
29.12.03	All steel doors shall consist of double plate flush door shutters. The door shutter shall be 45 mm thick with two outer sheets of 18 G rigidly connected with continuous vertical 20 G stiffeners at the rate of 150 mm centre to centre. Side, top and bottom edges of shutters shall be reinforced by continuous pressed steel channel with minimum 18 G. The door shall be sound deadened by filling the inside void with mineral wool. Doors shall be complete with all hardware and fixtures like door closer, tower bolts, handles, stoppers, aldrops, etc.			
29.12.04	Wherever functionally required, rolling shutters of suitable size approved by the Owner, with suitable operating arrangement manual/ electric shall be provided to facilitate smooth operations. Rolling shutters shall conform to IS: 6248.			
29.12.05	All windows and ventilators at ground floor level shall be provided with suitable anodised aluminum grill.			
29.12.06	Fire proof doors with panic devices shall be provided at all fire exit points as per the requirements. However minimum Fire rating shall be 2 hours. These doors shall be double cover plated type with mineral wool insulation.			
29.12.07	Hollow excluded Section of minimum 2 mm wall thickness as manufactured by INDAL, Jindal, Hindalco or equivalent shall be used for all Aluminium doors, windows, ventilators and Partitions.			
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29.12.08	The doors, Windows & ventilators frame shall be of suitable size & thickness for fixing the glazing. The Glazing thickness shall be minimum 6 mm thk clear toughened glass for all glazed doors, windows, ventilators & partitions. Windows in air conditioned areas shall be provided with 24mm thick hermetically sealed composite double glazing.														
29.12.09	Doors and windows on external walls shall be provided with sunshade over the openings with width 600 mm more than the opening width. The projection from the finished face of the wall for sunshade shall generally be 450 mm over window openings, 750 mm over door openings and 900 over Rolling shutters, or as decided and approved by the Engineer.														
29.12.10	Float glass or flat transparent sheet glass shall conform to IS: 2835.														
29.12.11	All glazing work shall conform to IS: 3548.														
29.12.12	Windows in conveyor gallery shall be provided with welded wire fabric of 1.6mm thick wire as per IS: 4948 and 12mm x 30mm mesh size.														
30.00.00	WATER SUPPLY, DRAINAGE AND SANITATION														
30.01.00	Polyethylene water storage tank conforming to IS: 12701 shall be provided (for the use of toilet, pantry and kitchen) over the roof, with adequate capacity depending on the number of users and 8 hours requirement complete with all fittings including float valve, stop cock etc. The capacity of tank shall be calculated minimum 500 liters, per toilet, pantry and kitchen														
30.02.00	Galvanised MS pipe of medium class conforming to IS: 1239 shall be used for internal piping works for potable water supply.														
30.03.00	Sand C.I. pipes with lead joints conforming to IS: 1729 shall be used for sanitary works above ground level.														
30.04.00	The facilities provided in the toilet block shall depend on the number of users. However, minimum facilities to be provided shall be as stipulated below. IS: 1172 shall be followed for working out the basic requirements for water supply, drainage and sanitation. In addition, IS: 2064 and IS: 2065 shall be also be followed.														
30.05.00	Each toilet block shall have the following minimum facilities. Unless specified all the fittings shall be of chromium plated brass (fancy type). The common toilet area shall have finished floor level at 15 mm below the finished floor level of surrounding area. Following minimum fittings & fixtures together with associated plumbing works shall be provided as specified below. <table><tr><th>Sl. No.</th><th>Type of Fitting / Fixtures</th><th>Gents Toilet</th></tr><tr><td>i)</td><td>1 no wall mounted coloured glazed vitreous china European water closet with flush valve.</td><td>1 No.</td></tr><tr><td>ii)</td><td>Coloured glazed vitreous china flat back lipped urinals with photo voltaic controlled automatic flushing system including all requisite fittings and fixtures</td><td>1</td></tr><tr><td>lii)</td><td>Wash Basin (oval shape) with photo voltaic control system and all requisite fittings and fixtures to be fixed on concrete platform finished with 18mm thick first</td><td>1 No.</td></tr></table>			Sl. No.	Type of Fitting / Fixtures	Gents Toilet	i)	1 no wall mounted coloured glazed vitreous china European water closet with flush valve.	1 No.	ii)	Coloured glazed vitreous china flat back lipped urinals with photo voltaic controlled automatic flushing system including all requisite fittings and fixtures	1	lii)	Wash Basin (oval shape) with photo voltaic control system and all requisite fittings and fixtures to be fixed on concrete platform finished with 18mm thick first	1 No.
Sl. No.	Type of Fitting / Fixtures	Gents Toilet													
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		grade polished granite stone	
	iv)	Wall to wall mirror minimum 450 mm high (minimum 6mm thick float glass) including all fittings	1 No.
	v)	Stainless steel Towel Rail 600mm Long x 20 mm dia.	1 No.
	vi)	Stainless steel Liquid soap holder cum dispenser with requisite fittings.	1 No.
	vii)	Overhead Drinking water storage tank (Minimum 500 Litres capacity)- High density polyethylene (cylindrical/vertical) molded seamless type.	1
	viii)	Overhead Service water storage tank (Minimum 500 Litres capacity)- High density polyethylene (cylindrical/vertical) molded seamless type	1 No.
	One No. drinking water connection with C.P. brass valve for fixing water cooler by Owner. Required plumbing work from Owner's service water terminal point to the service water tank and from tank to the toilet accessories mentioned above. Required plumbing work from Owner's potable water terminal point to the drinking water tank and from tank up to the water coolers. Janitor room. Adequate space shall be provided. Provision for installation of water cooler. 30.06.00 All structures, buildings, facilities, liquid storage tanks shall be provided with peripheral surface brick drains of all around periphery and suitably connected to nearest Owner's drain. Overflow and drains from storage tanks shall be laid to and suitably connected to Owner's open surface drains. 30.07.00 The sewerage and waste water disposal system shall consist of providing all associated plumbing and underground pipe works together with all fittings and fixtures and inclusive of ancillary works such as connections, manholes and inspection chambers, including connection to Owner's nearest main sewer line or as directed by Engineer. If required, R.C.C. septic tank and soak pit of required capacity shall be provided by the Bidder. 30.08.00 Miscellaneous Architectural Items (a.) In all buildings suitable arrangement with provision of floor traps for draining the water collected from leakage, floor washing, fire fighting etc. shall be provided on all floors which shall be connected to rain water down comers. (b.) Wherever required minimum 1000 high hand railing with 32 NB M.S. pipes medium class as per IS : 1239 shall be provided, with toe & knee rail and toe guard plate, around all floor / roof openings, around periphery of Neutralisation Pit, projections of balconies, walkways, platforms, steel staircase etc. (c.) However for RCC staircases in structures, buildings and facilities, railings with 20 mm square MS bar balustrades with suitable anti corrosive paint of approved colour MS flats for knee & toe guard with 50mm Ø NB MS pipe hand rail at top shall be provided. (d.) All air conditioned areas / common corridors shall be provided with false ceiling constructed from 15 mm mineral Fibre Board in tile form of		
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	600x600mm with supporting system as per manufacture guidelines. 50 mm thick mineral wool insulation (conforming to IS : 8183) shall be provided with as under deck insulation). Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures, Air conditioning ducts etc. Minimum headroom below false ceiling shall be 3.0 m. (e.) Under - deck insulation shall be provided on the ceiling (underside of roof slab) and underside of floor slab of air - conditioned areas depending upon the functional / air - conditioning requirements. The under - deck insulation shall consist of 50 mm thick mineral wool insulation conforming to IS : 8183 backed with 0.05 mm thick aluminium foil & 24 G x 25 mm mesh wire netting and shall be fixed to ceiling with 24 G wire ties and suitable fixing arrangements. (f.) Parapets, chajjas, window / door heads, architectural facias, fins etc., shall be provided with drip course in cement mortar (1 : 3). (g.) 150mm thick fillets at junction of roof slab / chajja slab and parapet / vertical walls shall be provided with cast - in - situ cement concrete 1 : 2 : 4 nominal mix, followed by 12 mm thick cement sand plaster (1 : 4). (h.) Suitable provision shall be made for fixing of ceiling fans in office areas of different structures, buildings and facilities.
31.00.00	CORROSION PROTECTION
31.01.00	GENERAL
	(a) All Steel structures shall be provided with painting as given in the specification. Further, painting system shall also meet the requirements of Corrosivity category C3 (durability High) as per ISO 12944. Painting system for steel surfaces embedded in Concrete is given separately. (b) All Painting shall be done as per technical specification. Painting scheme shall be submitted by the bidder for approval of employer. (c) All steel structures shall be designed by following basic design criteria in ISO 12944 Part 3. However, where it is not feasible to follow the design criteria given in ISO 12944 Part 3 where the steel surface are inaccessible for application of protective coating, corrosion allowance of 1.5 mm shall be kept in thickness(over the design thickness) of structural steel members. d) Painting scheme shall be resubmitted by the Bidder for approval of employer.
31.02.00	PAINTING OF STEEL SURFACES EMBEDDED IN CONCRETE: a) For the portion of Steel surfaces embedded in Concrete, the surface shall be prepared by Manual Cleaning and provided with Primer Coat of Chlorinated Rubber based Zinc Phosphate Primer of Minimum 50 Micron Dry Film Thickness (DFT). b) All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, sleeves, etc. shall be coated with temporary rust preventive fluid and during execution of civil works, the dried film of coating shall be removed using organic solvents.
31.03.00 CONCRETE)	PAINTING OF STEEL SURFACES (OTHER THAN THOSE EMBEDDED IN
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	a) All steel surfaces shall be provided with two component moisture curing zinc (ethyl) silicate primer coat (having minimum 80% of metallic Zinc content in dry film, solid by volume minimum 60% ±2%) of minimum 70 micron DFT to be applied over blast cleaned surface conforming to Sa 2 ½ finish of ISO 8501-1 with surface profile 40-60 Micron. The primer coat shall be applied in shop immediately after blast cleaning by airless spray technique. Zinc dust composition and properties shall be Type-II as per ASTM D520-00. b) Primer coat shall be followed with the application of Intermediate coat of two component polyamide cured epoxy with MIO Content (containing lamellar MIO minimum 30% on pigment, solid by volume minimum 80% ±2%) of minimum 100 micron DFT. This coat shall be applied in shop after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied shop after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer. Notes: 1. For Primer, high quality surface preparation is necessary and good amount of moisture is required for proper curing. Below 70 % relative humidity, curing time may go up to 7 days or more. In such a case additional water sprinkling may be ensured for completion of curing. Additionally Inorganic zinc silicate cannot be recoated; even with itself. Typically it should be used when coating bare steel surface for first time. 2. The most frequent problem associated when top coating Primer is bubbling/pin holing especially with non-weathered zinc silicate coatings. To a great extent, this bubbling of finish paint can be eliminated by applying a mist coat of intermediate/topcoat as the first pass of the product, allow the bubbles to subside and then apply a full coat, as required. 3. In case top coating of zinc silicate with epoxy/polyurethane coatings, is expected to be delayed, it is advisable to use a suitable tie coat to avoid formation of white rust. However, if white rust forms then clean the surface with high pressure water, dry and apply the subsequent coats as required. 4. Touch up paintings on damaged areas: Surface preparation by manual tools, wire brush/ emery paper etc. Minimum 6 inches peripheral area, adjoining to damaged area to be covered. If metal surface is exposed, it is to be painted with Zinc rich epoxy (70 micron) or suitable primer with existing paint scheme. If primer is intact, intermediate & top coat to be done with specified DFT in scheme.				
31.04.00	COATING FOR MILD STEEL PARTS IN CONTACT WITH WATER. a) All mild Steel parts coming in contact with water or water vapour shall be hot dip galvanised. The Minimum Coating of Zinc shall be 610 Gms / Sq. M. for galvanised Structures and shall comply with IS: 4759 and other relevant Codes. Galvanising shall be checked and tested in accordance with IS: 2629.				
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	b) The galvanising shall be followed by the application of an etching Primer and dipping in black bitumen in accordance with BS: 3416, unless otherwise specified.		
31.05.00	Gratings All gratings shall be blast cleaned to Sa 2 ½ finish or cleaned by acid pickling as per ISO 8501-1 and shall be hot dip galvanized at the rate of 610 Gms / Sq. M.		
31.06.00	Hand Railings and Ladders All Mild steel handrails and ladders shall be galvanised at the rate of 610 Gms / Sq. as per IS: 4736. However, Stainless steel handrails shall be provided as specified in General Architectural Specification clause 9.0.0.		
31.07.00	Sea Worthiness All Steel Sections and fabricated Structures, which are required to be transported on sea, shall be provided with anti corrosive Paint before shipment to take care of sea worthiness.		
31.08.00	For Reinforced Concrete Work. i) The protection for concrete sub-structure shall be provided based on aggressiveness of the soil, chemical analysis of soil/sub-soil water and presence of harmful chemicals/salts. ii) The protection to super structure shall depend on exposure condition and degree of atmospheric corrosion. This shall require use of dense and durable concrete, control of water cement ratio, increase in clear cover, use of special type of cement and reinforcement, etc., coating of concrete surface, etc., Bidder shall furnish the details of corrosion protection measures.		
32.00.00	Miscellaneous		
32.01.00	Ordinary form work shall be used in roofs and floor slabs in transfer houses, footings, pedestals, cable trenches, pits etc., Plywood form work shall be used for all over ground exposed work like columns, beams, floors and ceilings in control room and M. C. C. buildings.		
32.02.00	Monorail girders and fixtures shall be provided for monorails at the locations as required and as described elsewhere in these specifications or drawings. Monorail openings in the walls shall be provided with steel frame doors preferably sliding type or otherwise open able inside, access platforms and ladders.		
32.03.00	Steel frame around openings in roof and on external walls for mounting of exhaust fans shall be provided.		
32.04.00	Ready mix non - shrink cementitious grout of reputed manufacturer as approved by the Employer shall be used for grouting of block outs and foundation bolts, underpinning of base plates and machine bases. Crushing strength of grout shall be one grade higher than the foundation concrete. Minimum crushing strength shall be 30 N / mm² unless higher strength requirement is specified by the equipment supplier or the grout manufacturers.		
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32.05.00	The bottom of steel in case of cable / pipe galleries and trestles shall be generally 3m above the ground except for rail / road crossing where it shall be 8m above the rail top / road crest/ground. Further in bunker areas it shall be 8 m above the ground.				
32.06.00	Polysulphide Sealing Compound shall be two-part polysulphide sealant and shall be from approved manufacturer, conforming to IS : 12118. Materials shall consist of polysulphide polymer and a curing agent. Gun grade material shall be used unless otherwise specified. The application of the sealant shall be strictly followed as per manufacturer's guidelines.				
33.00.00	SHOTCRETING				
33.01.00	General Requirements				
33.01.01	Generally, shotcreting shall be done in accordance with IS : 9012.				
33.01.02	Reinforcement for shotcreting shall be as detailed below, unless specified otherwise. Reinforcement in one direction consisting of 6 mm M. S. bars at 750 mm c / c shall be connected to the lugs for fastening of the wire fabric. This shall be used in case of 50 mm or above thick shotcreting.				
33.01.03	Wire fabric conforming to IS : 1566 shall be used as reinforcement and shall consist of wire, 3 mm diameter, spaced 50 mm both ways and shall be electrically cross welded. Wire fabric shall be securely tied to 6 mm bars for 50 mm thickness. Adjacent sheet of wire fabric shall be lapped at least 100 mm and tied.				
33.01.04	Clear cover to reinforcement mesh shall not be less than 15 mm.				
33.01.05	Minimum thickness of shotcreting shall be 50 mm. for abrasion resistant work and 25 mm for ordinary surface protection work.				
33.02.00	Material Generally, the materials shall be in accordance with aggregates specification given hereunder.				
33.02.01	Fine aggregate shall consist of natural sand or crushed stone from a known source and shall be strong, hard, coarse, sharp, chemically inert, clean and free from any coating. It shall be free from clay, coal or coal residue, organic or any other impurities that may impair the strength or durability of the concrete and shall conform to IS : 383.				
33.02.02	Fine aggregate (Sand) shall be well graded and particles shall range in size within the following limits. The Engineer, may approved the use of any other grading as per requirement or as per IS : 9012.				
33.02.03	The fineness modulus shall be preferably between 2.5 and 3.3. Any other value can be used, with prior approval of the Engineer.				
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33.03.00	Application		
33.03.01	After the placement of reinforcement and / or welded mesh and not more than six hours prior to the application of shotcrete, the surface shall be thoroughly cleaned of all loose materials and dirt. The Contractor shall properly prepare the surfaces, reinforcement and / or welded mesh to receive the shotcrete. Cleaned surfaces shall be wetted not more than hour prior to shotcreting.		
33.03.02	The mix as placed on surface shall be one part cement to three parts approved sand by mass. Cement and sand shall be dry mixed; not water shall be added after mixing and before using in the gun. The quantity of water when added shall be only that which is sufficient to hydrate the cement. For average atmospheric conditions, the water cement ratio for shotcrete in place shall be between 0.35 and 0.5 by mass. Suitable admixture shall be used wherever required.		
33.03.03	A uniform pressure of not less than 3 Kg/cm ² at the nozzle shall be maintained. Necessary adjustments shall be made to ensure this pressure, taking into account the length of hose and height of the place to be shotcreted, above location of the machine.		
33.03.04	The application shall proceed in an upward direction. Beams, stiffeners and intermediate walls, if any, shall be wrapped with wire fabric and completely covered with shotcreting. All rebound shall be removed from the area of application as the work progresses and such rebound material shall not be reused.		
33.03.05	As soon as the freshly shotcreted surface shows the first dry patches, a fine spray of water shall be applied to keep too moist. After the surface has hardened, it shall be kept continuously moist for minimum seven days. If there is extreme heat, especially when accompanied by hot winds, the shotcreted surface, immediately upon completion, shall be covered with burlap or similar covering, which must be kept continuously moist for 14 days after shotcreting. The temperature of the lining shall not be permitted to exceed 38 ⁰ C during placing of concrete.		
34.00.00	VIBRATION ISOLATION SYSTEM		
	These specifications are meant for the design, supply and erection of vibration isolation system for supporting crushers.		
34.01.00	Supporting Arrangement		
34.01.01	~~For Crushers:~~		
	~~The crushers shall be supported on vibration isolation system consisting of steel helical springs and viscous dampers. The supporting arrangement for each crusher shall consist of an R. C. C. deck supported on steel helical spring units and viscous damper units which in turn shall be supported on girders. The girders shall be an integral part of the crusher house building.~~		
	~~The part of the structure consisting of the R. C. C. deck, springs and viscous dampers shall hitherto be referred to as “spring supported foundation”. The part of the structure, which is below the spring shall hitherto be called “supporting structure”.~~		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
34.01.02	The Contractor should do the Engineering / design, supply and erection of vibration isolation system consisting of steel helical spring units and viscous dampers supporting the top deck which in turn would support the crushers. The vibrations isolation system supplied shall be of a proven make. The Contractor or his sub - contractor who designs and supplies the system should have designed, supplied and installed such systems for not less than five machines of speeds and unbalance forces comparable to the machine proposed by the vendor. The vibration isolation systems installed by the contractor or his sub - contractor in such machines should have been working satisfactorily for at least five years.		
34.02.00	Scope of Work		
34.02.01	Scope of work shall include the following :		
	(a.) Engineering		
	(1.) Design of the vibration isolation system using steel helical springs and viscous dampers to support an R. C. C. top deck supporting the equipment. This includes the static and dynamic analysis of the vibration isolation system with the R. C. C. top deck and the equipment.		
	(2.) Structural design of the R. C. C. top deck including preparation of General Arrangement drawings, detailed reinforcement drawings, bar - bending schedules etc.		
	(3.) Calculation of loads on the structure supporting the springs and viscous dampers, their points of application and the stiffness requirements of the supporting structure.		
	(4.) Drawings showing embedments and their locations and details on the R. C. C. top deck.		
	(5.) Drawings showing blockouts, recesses etc. on the top deck.		
	(6.) Design of the supporting structure, including preparation of detailed drawings and bill of materials.		
	(b.) Supply including packing and transportation to site		
	(1.) Steel helical spring units and viscous dampers, including associated auxiliaries for installation of the spring units and dampers like steel shims, adhesive pads etc.		
	(2.) Frame (s) for pre-stressing of spring elements.		
	(3.) Suitable hydraulic jacks system including electric pumps, high pressure tubes etc. required for the installation, alignment etc. of the spring units, two extra hydraulic jacks, one hand operated pump and spares for the hydraulic jack system as required.		
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	(c.) Erection and Commissioning (1.) Complete erection and commissioning of the vibration isolation system including : (2.) Pre-stressing of spring elements, placing of spring elements in position, checking clearances on the shuttering of the R. C. C. top deck, construction of the supporting structure and the R. C. C. top deck, releasing to pre-stress in spring elements and making final adjustments and alignments after machine installation etc. (3.) The scope of work shall be deemed to include all activities which may not have been explicitly mentioned but are reasonably implied for the successful completion of the work for which these specifications are intended. (4.) This part of the specifications is for vibration isolation system. For the construction of the supporting structure for the crusher and the top deck, the relevant parts of the specification should be referred to. (d.) Documentation (1.) Submission of detailed design calculation, analysis (static and dynamic) and drawings for Employer's acceptance and approval. (2.) Furnishing methodology of providing shuttering and its removal as well as concreting of deck slab, installation of springs and dampers and the sequence of operation. (3.) Furnishing installation and maintenance manual indicating equipment, procedure etc., necessary for installation, maintenance of vibration isolation system. (4.) Furnishing a check list for confirming the readiness of the civil fronts for the installation of vibration isolation system and equipment required at each stage installation. (5.) Bill of materials of various elements such as springs, visco-dampers, with their rating, stiffness etc., included in supply. (6.) Detailed specifications of the vibration isolation system and various items included in the supply and the standard (local or international) to which they conform. (7.) Proposed erection strategy of the entire system.		
34.03.00	~~Design Requirements for Crusher Foundation~~		
34.03.01	~~Dynamic Analysis~~		
	~~Detailed dynamic analysis shall be done for the top deck together with springs and dampers and the natural frequencies and amplitudes of vibration shall be~~		
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	determined. A mathematical model of the top deck shall be formulated with three - dimensional beam / plate finite elements for the purpose of analysis with the spring idealised with vertical and horizontal stiffnesses. The mass of the machine together with that of the top deck shall be considered for the analysis. Natural frequencies upto at least 10 % above the operating speed shall be determined and these frequencies shall be checked against the design criteria. Forced response dynamic analysis shall be carried out for the operating condition unbalance forces using a sinusoidal forcing function. Unbalance forces as given by this specifications shall be used for his purpose. The amplitudes shall be checked against the design criteria. The dynamic forces from this analysis shall be used for structural design with a suitable fatigue factor.			
34.03.02	Isolation Efficiency			
	The vibration isolation system shall be designed for about 90 % isolation efficiency.			
34.03.03	De-coupling			
	A ratio of the least 10 (ten) shall be ensured between the stiffness of the supporting structure and the stiffness of the spring system in the vertical direction to achieve de-coupling between the two (the stiffness of the spring system being lower). This ensures that dynamic analysis of the supporting structure need not be carried out.			
34.03.04	Frequency Criteria			
	The frequency criterion has already been laid down implicitly by the isolation efficiency criteria and de-coupling required. The first bending mode frequency of the top deck shall be at least 20 % above the operating speed.			
34.03.05	Unbalance Forces for Crushers			
	Unbalance forces arising out of all the following cases shall be considered for checking the design and amplitudes. (a.) Balance quality grade Q 40 as per VDI 2060 - 1966. (b.) One hammer broken condition. The missing hammer shall be assumed to be closest to the crusher non - drive end of the crusher. (c.) Three hammers broken condition. All the three hammers broken shall be assumed to be from the same suspension bar and located at the non - drive end of the crusher.			
34.03.06	Amplitude Criteria for Crushers			
	The calculated amplitudes (mean to peak values) shall not exceed following limits under the specified conditions.			
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	1) Operating speed of 750 RPM (a.) 150 microns for an unbalance force arising out of balance quality grade Q 40 as per VDI 2060 - 1966. (b.) 300 microns in case of a one hammer broken condition. (c.) Amplitudes need not be checked for a three hammer broken condition. 2) Operating speed of 450 RPM (a.) 200 microns for an imbalance force arising out of balance quality grade Q-40 as per VDI -2060-1966. (b.) 400 microns in case of a one hammers broken condition. (c.) Amplitude need not be checked for a three hammer broken condition. For intermediate operating speed between 450 to 750 RPM the amplitude limits can be linearly interpolated. The amplitude limits mentioned above are in both vertical and horizontal directions. The amplitudes shall be calculated at critical points on the top surface of the R. C. C. deck. The amplitudes shall be checked for the most unfavorable superposition of modes in any direction. However, phase difference between the maximum amplitude occurring in different directions due to the rotating vetor may be considered while superimposing the modes.		
34.03.07	Unbalance force and Amplitude Criteria The unbalance forces and amplitude criteria shall be as per the equipment manufacturer's recommendations or as per VDI 2060/ VDI 2056, whichever is more stringent.		
34.03.08	Transient Resonance Transient resonance, which may occur during the start - up or coasting down condition of the crusher, shall be checked, and the amplitudes in such a condition should not exceed one - and - half times those at operating speed for each design condition.		
34.04.00	Strength Criteria The following criteria shall apply for the design of top deck : (a.) Dead loads, live loads, Seismic loads and dynamic loads shall be considered for the design. The most unfavorable combination shall considered for design. (b.) Seismic loads shall be assumed to act together with dynamic loads for a one millimeter eccentricity in the rotor. However, seismic loads and dynamic loads arising out of hammer breakage need not be considered together		
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	(c.) Fatigue shall be considered while designing for dynamic forces. A fatigue factor of 2.0 shall be used on all dynamic forces to arrive at the equivalent static force for the purpose of design. (d.) Working stress method shall be used for the design of R. C. C. deck. In survival condition, 10 % overstressing may be permitted. (e.) The R. C. C. top deck shall be at least of M35 grade of concrete as per IS : 456. (f.) Fatigue need not be considered for the three hammer broken condition. (g.) For calculating unbalance forces, the heaviest hammer (plain or toothed) shall be considered.		
34.05.00	Approval of Designs and Drawings All design calculation, drawings and documents shall be in English. All design calculations and drawings shall be submitted to Employer for approval. However, approval of such designs and drawings shall not relieve the contractor of his responsibility regarding the adequacy of the foundation to carry the design forces.		
34.06.00	Standards Latest revisions of the following Codes shall be used for the design of the crusher foundations. (a.) IS : 456 Code of Practice for Plain and Reinforced concrete. (b.) IS : 2974 (Part IV) Code of Practice for Design and Construction of Machine Foundations (Part IV) for rotary type machine of low frequency. (c.) IS : 1893 (Criteria for Earthquake Resistant Design of Structures). (d.) DIN 4024 Machine Foundations : Flexible supporting structures for machines with rotating masses. (e.) DIN 2089 Helical Compression Springs out of round wire and rod; calculation and Design. (f.) DIN 2096 Helical Compression Springs out of round wire and rod; quality requirements for hot formed compression springs. (g.) VDI 2056 - Criteria for assessing mechanical vibrations of machines. (h.) VDI 2060 - Criteria for assessing the state of balance of rotating rigid bodies.not be permitted to exceed 38°C during placing and curing		
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35.00.00	Packaging and Transportation. All the equipment shall be suitably protected coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials the limitations from the point of view of availability of railway wagon sizes in India should be taken into account. The contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing.			
36.00.00	Plant Life The plant shall be designed for a minimum operating life of 30 years under the conditions of operation. Assurance shall be given that plant components are adequate for this lifetime. If there are any exceptional items of the plant on which an assurance of meeting this clause cannot be given, life of such components and the difficulties associated with them shall be stated.			
37.00.00	PTFE (Poly Tetra Fluoroethylene) Bearing The bearing shall be of reputed make and manufacturer as approved by the Engineer, for required vertical load and end displacement/rotation. PTFE bearing shall be sliding against highly polished stainless steel and the coefficient of friction between them shall be less than 0.06 at 55 kg/sq.cm. In order to prevent cold flow in PTFE surface it shall be rigidly bonded by a special high temperature resistance adhesive to the stainless steel substrata. The stainless steel surface that slides against the PTFE is mirror polished. The stainless steel shall be bonded to the top plate by special high strength adhesive. The thickness of stainless steel plate shall be between 1.0 mm to 1.5 mm.			
38.00.00	TESTS FOR MATERIAL / WORKMANSHIP All tests required for all materials, quality of workmanship or any other tests as desired by the Engineer shall be at contractor's cost.			
39.00.00	MATERIALS			
39.01.00	For Civil, Structural and Architectural works Employer will not supply any material. All materials including cement, reinforcement steel and structural steel, whatsoever required for execution and completion of the entire scope of work covered under this specification shall be arranged by the contractor at his own cost. All materials procured by the contractor shall meet the quality requirements specified in this specification. The contractor shall keep sufficient stock of cement and steel at site at any point of time when the work is in progress excluding what has been already incorporated in the works, so that any disruption / delay in availability of these materials during procurement will not affect the progress of work at site. The minimum quantity of such materials in stock at site shall not be less then the Requirement of one (1) month in case of Cement and Requirement of two (2) Consecutive months in case of Steel.			
LOT-1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 65 OF 69

CLAUSE NO.	TECHNICAL REQUIREMENTS		
39.02.00	Structural steel		
	Structural Steel (including embedded Steel) shall be straight, sound, free from twists, cracks, flaw, laminations and all other defects. Structural steel shall comprise of mild steel, medium strength steel and high tensile steel as specified below.		
39.02.01	Mild Steel		
	a) Rolled sections shall be of grade designation E250, Quality A/BR, Semi-killed/ killed conforming to IS 2062. All steel plates shall be of Grade designation E250, Quality BR (fully killed), conforming to IS 2062 and shall be tested for impact resistance at room temperature. Plates beyond 12mm thickness and up to 40mm thickness shall be normalized rolled. Plates beyond 40mm thickness shall be vacuum degassed & furnace normalised and shall also be 100% ultrasonically tested as per ASTM –A578 level B-S2. b) Pipes shall conform to IS 1161. c) Hollow (square and rectangular) steel sections shall be hot formed conforming to IS: 4923 and shall be of minimum Grade Yst 240. d) Chequered plate shall conform to IS 3502 and shall be minimum 6 mm thick excluding projection. Steel for chequered plate shall conform to grade E250A semi killed of IS: 2062 or equivalent grade conforming to ASTM & BS standards only.		
39.02.02	Medium and High Tensile Steel		
	Rolled Sections and plates shall be of grade designation E350 or higher, Quality B0 (Fully killed), conforming to IS 2062. Plates beyond 12mm thickness and up to 40mm thickness shall be normalized rolled. Plates beyond 40mm thickness shall be vacuum degassed & furnace normalised and shall also be 100% ultrasonically tested as per ASTM –A578 level B-S2.		
39.03.00	Fly ash based Portland pozzolona cement conforming to IS: 1489 Part - I shall preferably be used. However, the contractor may use other types of cements conforming to IS: 269, IS: 8112, IS: 12269, & IS: 455.		
39.04.00	Reinforcement steel shall conform to:		
	a) Mild steel bars of grade I of IS: 432 Part – I or grade A of IS: 2062. b) High yield strength deformed TMT steel bars of grade Fe-500 having minimum elongation of 14.5 % or Fe-500D, and conforming to other requirements of IS 1786.		
40.00.00	CODES AND STANDARDS		
	All standards, specifications, acts and code of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. Other Indian, foreign Codes and Standards not listed here but referred to elsewhere within this specification shall also be deemed to be part of this list. In case of conflict between this specification and those (IS standards, codes etc.) referred to herein, the former shall prevail.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	Some of the relevant Indian standards, Acts and Codes applicable to this section of the specification are listed below		
	IS : 383	Specification for coarse and fine aggregates from natural sources for Concrete.	
	IS : 432	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.	
	IS : 456	Code of practice for plain and reinforced concrete.	
	IS : 458	Specification for concrete pipes.	
	IS : 516	Method of test for strength of concrete.	
	IS : 800	Code of practice for use of structural steel in general building construction.	
	IS : 814	Specification for covered electrodes for metal arc welding for weld steel.	
	IS : 816	Code of practice for use of metal arc welding for general construction.	
	IS : 817	Code of practice for training and testing of metal arc welders.	
	IS : 875 (Pt. I to V)	Code of practice for design loads other than earthquake) for buildings and structures.	
	IS : 1038	Steel doors, windows and ventilators.	
	IS : 1172	Basic requirements for water supply, drainage and sanitation.	
	IS : 1361	Steel windows for industrial buildings.	
	IS : 1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.	
	IS : 1892	Code of practice for subsurface investigation for foundation.	
	IS : 1893	Criteria for earthquake resistant design of structures.	
	IS : 1904	Code of practice for design and construction of foundations in soils; general requirements.	
	IS : 1905	Code of practice for structural safety of buildings - Masonry walls.	
	IS : 1948	Specification for aluminium doors, windows and ventilators.	
	IS : 2062	Steel for general structural purposes.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	IS : 2131 Method of standard penetration test for soils. IS : 2212 Code of practice for brickwork. IS : 2645 Specification for Integral cement water proofing compounds. IS:2720 (Part-II, IV TO VIII, XIV, XXI, XXIII, XXIV, XXVII TO XXIX, XL) Methods of test for soils - determination for water content etc code of practice for earth work on canals. IS : 2911 Code of practice for design and construction of pile foundations. (Part-1/Sec.1) Driven cast in situ concrete piles. (Part-1/Sec.2) Bored cast-in-situ concrete piles. (Part-IV) Load test on piles. IS : 2974 (Part - I TO V) Code of practice for design and construction of machine foundations. IS : 3370 (Part I to IV) Code of practice for concrete structures for the storage of liquids. IS : 3658 Code of practice for liquid penetrant flaw detection. IS : 3664 Code of practice for ultra sonic testing by pulse echo method. IS : 4326 Code of practice for earthquake resistant design and construction of buildings. IS : 4990 Specification for plywood for concrete shuttering work. IS : 5624 Specification for foundation bolts. IS : 7215 Tolerances for fabrication steel structures. IS : 8112 Specification for 43 grade Ordinary Portland Cement. IS : 9103 Specification for admixtures for concrete. IS : 9595 Code of procedure of manual metal arc welding of mild steel. IS : 10262 Recommended guidelines for concrete mix design. IS : 13311 Method of non - destructive testing of concrete. IS : 13755 Dust pressed ceramic tiles with water absorption of 3%, E6% (Group B11a)			
LOT-1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 68 OF 69

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	ASTM 898 -89 Standard guide for use of high solid content, cold liquid-applied elastomeric water proofing membrane for use with separate wearing course. AS/NZS 2728 Pre finished / pre painted sheet metal product for interior / exterior building applications – Performance requirements. AS : 1365 Standards for steel manufacturing. AS : 1397 A steel sheet & strip – hot – dipped-zinc-coated or Aluminium-Zinc coated. AS : 3566 Self drilling screws for building and construction industry. IRC : 37 Guidelines for the design of flexible pavements. - Manual on sewerage and sewage treatment (Published by CPH & EEO) As updated. Indian Explosives Act. 1940 as updated. For “Foundation System and Geotechnical Data” refer “Project Information section” of Technical specification.		
LOT-1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 69 OF 69

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
1.	PAR T-B	IV-D	3.07.00	8 OF 69	Gypsum Storage Shed The Gypsum storage shed shall be RCC framed structure with structural steel work shed with permanently colour coated profiled steel sheet roof and side cladding and RCC foundations etc. Roof shall be provided with troughed profile permanently colour coated sheet of 1 in 5 for quick drainage of rain water	Gypsum Storage Shed The Gypsum storage shed shall be RCC framed structure with RCC/ Brick infill wall (upto Tripper floor) and structural steel shed with permanently colour coated profiled steel sheet roof and side cladding (above tripper floor). Roof shall be provided with troughed profile permanently colour coated sheet with slope of 1 in 5 for quick drainage of rain water. At grade level Heavy duty paving as detailed elsewhere in the specification shall be provided inside the shed.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
2.	V/IB	IV-D	3.14.01, Para 1	10 of 69	Single-flue or multi-flue chimney(s) shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level.	Single-flue chimney(s) shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres.
3.	V/IB	IV-D	3.14.08	14 of 69	Thermal insulation The insulation shall be semi rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be used. pins and speed washer.	Thermal insulation (Applicable in case of Titanium / C-276 Flue Liner) The insulation shall be semi rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be used. pins and speed washer.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
4.	VI/B	IV-D	3.14.09,	15 of 69	(iv) The inside surface of chimney shell above roof, horizontal surface of shell at top, underside of concrete roof slab, external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.	(iv) The inside surface of chimney shell above roof, horizontal surface of shell at top, underside of concrete roof slab etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.
5.	VI/A	II-A8	6.00.00, Annexur e-B	8 of 31	a) The basic wind speed “V _b ” at ten metres above the mean ground level	a) The basic wind speed “V _b ” at ten metres/second

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
6.	VII/A	II-A10	7.02.00	10 OF 30	For excavation 6 metres below FGL, sheet piling shall be provided.	Excavation may be carried out by using either sheet piling/ diaphragm wall/ secant piling/ contiguous piling or their combination.
7.	VII/A	II-A7/A8/A3/A5/A11	7.02.03 (xv)	14 OF 33/ 13 OF 31/ 14 OF 31/ 14 OF 40/ 15 OF 29	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load tests shall prevail.	Either of Static routine load test or High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
					load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.
8.	VII/A	II-A10 Project Information Barh STPP Stage-I	7.00.00	10 to 13 of 30	SOIL DATA AND FOUNDATION SYSTEM	“SOIL DATA AND FOUNDATION SYSTEM” given in “Annexure-1” to this amendment shall replace the contents of Clause 7.00.00, Page 10 to 13 of 30, Sub-section-II-A10, Part-A Sec-VI, of Tech. Specification.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
9.	VII/A	II-A6 Project Information Solapur	7.00.00	9 to 21 of 31	Foundation system & Geotechnical data	“Foundation system & Geotechnical data” given in “Annexure-2” to this amendment shall replace the contents of Clause 7.00.00, Page 9 to 21 of 31 , Sub-section- II-A6, Part-A Sec- VI, of Tech. Specification.
10.	VII/A	II-A4 Project Information Darlipali	Annexur e-IV of clause 7.00.00	-	-	“Annexure-IV BORE LOGS” at “Annexure-3” to this amendment added with clause 7.00.00, II-A4, Part-A Sec-VI, of Tech. Specification.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
11.	VII/A	II-A9 Project Information Meja TPP-I	Annexur e-IV of clause 7.00.00		Annexure-IV Borelog	“Bore Log ” given in “Annexure-4” to this amendment shall replace the contents of Page 26 to 28 of 36 , Clause 7.00.00 , Sub-section-II-A9, Part-A Sec-VI, of Tech. Specification.
12..	VII/A	II- A1/A2//A4/ A5/ A6/A8/A11	-	-	-	Electrical Resistivity Test (ERT) Data at “Annexure-5”.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
13.	VII/A	IIA2 Project Information Lara STPP Stage-I	5.00.00	3 to 10 of 48	"CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT"	"CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT" given in "Annexure-6" to this amendment shall replace the contents of Clause 5.00.00, Sub-section- II-A2, Part-A Sec-VI, of Tech. Specification.
14.	VII/A	II-A10 Project Information Barh STPP Stage-I	5.00.00	2 to 7 of 30	"CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT"	"CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT" given in "Annexure-7" to this amendment shall replace the contents of Clause 5.00.00, Sub-section- II-A10, Part-A Sec-VI, of Tech. Specification.

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SL. No.	Secti on / VI / Part A	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
15.	Secti on VI / Part A	Sub- Section III D	1.06.00	2 of 4	Uniform Finished Ground Level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	Uniform Finished Ground Level (FGL) in FGD areas shall be made available by the owner at a level specified in tender drawing.
16.	Secti on VI / Part A	Sub-section IIID	2.00.00	2 of 4	Bidder shall provide permanent access to all facilities/structures from the nearby existing roads of the Owner. Roads shall be in concrete as per IRC standards, with minimum thickness of pavement (PQC) as 250mm (in M 35) as per IRC standards, with minimum thickness of pavement (PQC) as 250mm (in M 35 grade) and DLC of 150 thick (in M 10 grade). Double lane road (width 12m having 7.5m wide pavement & 2.25m wide shoulders on both sides) shall be provided.	Bidder shall provide permanent access to all facilities/structures from the nearby existing roads of the Owner. Roads shall be in concrete as per IRC standards, with minimum thickness of pavement (PQC) as 250mm (in M 35 grade) and DLC of 150 thick (in M 10 grade). Double lane road (width 12m having 7.5m wide pavement & 2.25m wide shoulders on both sides) shall be provided.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
17.	Secti on VI / Part B	Sub-section IVD	15.00.00	32 of 69	 Sewage pump house shall be provided as per IS:4111.	 Sewage pumping stations shall be provided as per IS:4111.
18.	Secti on VI / Part B	Sub-section IVD	14.00.00	31 of 69	These values shall be based on rainfall intensity of 90mm/hr	Th ese values shall be based on rainfall intensity of 75mm/hr

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SL. No.	Secti on / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
19.	Secti on VI / Part A	Sub Section IIA10 Project information, BARH STPP STAGE-1 (3X660MW)	2.00.00	30 of 30		The topographical survey drawing no: 9562-999-POC-F-002 is attached with this amendment as Annexure-8
20.	Secti on VI / Part A	Sub Section IIA8 Project information, NABINAGA STPP STAGE-1 (3X660MW)	10.00.00	31 of 31		The topographical survey drawing no: 0370-999-POC-F-002 is attached with this amendment as Annexure-9

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
21.	Secti on VI / Part A	Sub Section IIA2 Project information, LARA STPP STAGE-1 (2X800MW)	-	48 of 48		The topographical survey drawing no: 9548-999-POC-F-002 is attached with this amendment as Annexure-10
22.	Secti on VI / Part B	Sub-Section-IV- D Civil Works	4.02.00	18 to 19 of 69	The scope for potable water supply includes all distribution conforming to IS: 458 and at rail crossing R.C.C. box culvert to be provided. For sewerage below ground stoneware pipes conforming to IS: 651 with concrete bedding and haunch.	The scope for potable water supply includes all distribution conforming to IS: 458 and at rail crossing R.C.C. box culvert to be provided.

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23.	Secti on VI / Part B	Sub-Section-IV- D Civil Works	7.00.00, Para-2	24 of 69	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering. The detailed material property requirement of metal deck sheet is specified elsewhere in the specification. These profiled metal deck sheets shall be fixed to the structural steel beams/ purlins using headed shear anchor studs specified elsewhere in the specification.	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.6mm as permanent shuttering. The detailed material property requirement of metal deck sheet is specified elsewhere in the specification. These profiled metal deck sheets shall be fixed to the structural steel beams/ purlins using headed shear anchor studs specified elsewhere in the specification.

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24.	Secti on VI / Part B	Sub- Section-IV- D Civil Works	3.03.00, Para-1	6 of 69	The over ground portion of the transfer house shall be framed structure..... ...Brick wall cladding shall be supported on encased wall beams and suitably anchored to adjoining columns and beams. Vertical beams. Contractor shall have option to use tubular steel sections for roof truss only. Vertical bracings shall be provided only on four sides along the periphery. Grade slab with 0.9m height one brick thick wall plastered on both side at periphery shall be provided for all transfer houses.	The over ground portion of the transfer house shall be framed structure.....Brick wall cladding shall be supported on encased wall beams and suitably anchored to adjoining columns and beams. Vertical bracings shall be provided only on four sides along the periphery. Grade slab with 0.9m height one brick thick wall plastered on both side at periphery shall be provided for all transfer houses.

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25.	Secti on VI / Part B	Sub-Section-IV-D Civil Works	3.04.00, Para-1	7 of 69	The crusher house shall be framed structure..... Adequate steel doors and windows for natural lighting and ventilation shall be provided. Contractor shall have option to use tubular steel sections for roof truss only. Vertical bracings shall be provided only on four sides along the periphery.	The crusher house shall be framed structure..... Adequate steel doors and windows for natural lighting and ventilation shall be provided. Vertical bracings shall be provided only on four sides along the periphery.
26.	Secti on VI / Part B	Sub-Section-IV-D Civil Works	3.09.00, Para-1	8 of 69	All floors of transfer points/crusher houses and other facility buildings shall be accessible through staircase. For steel staircases, Stringers shall be of rolled steel channel (minimum SMC 250) and tread shall be of steel gratings. Out side stairs to transfer points/crusher house shall be open type. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection for treads of stairs in underground TP's.	All floors of transfer points/crusher houses and other facility buildings shall be accessible through staircase. For steel staircases, Stringers shall be of rolled steel channel (minimum SMC 250) and tread shall be of steel gratings. Out side stairs to transfer points/crusher house shall be open type. However sheeting shall be provided at the top. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection for treads of stairs in underground TP's.

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27.	Secti on VI / Part B	Sub-Section-IV-D Civil Works	3.01.00, Para-11	3 of 69	Plinth protection along with drains shall be provided along the Hopper complex. However, 5m wide paving shall also be provided around machinery hatches.	Plinth protection along with drains shall be provided along the Hopper complex. However, minimum 5m wide paving shall also be provided around machinery hatches and Truck hopper.
28.	Secti on VI / Part B	Sub-Section-IV-D Civil Works	24.00.00 ,	42 of 69	CONCRETE c) M35- For spring supported RCC deck	CONCRETE c) M35- For spring supported RCC deck and rail load bearing structure (if applicable).

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29.	Secti on VI / Part B	Sub-Section-IV-D Civil Works	39.03.00 ,	66 of 69	Fly ash based Portland pozzolana cement conforming to IS: 1489 Part - I shall preferably be used. However, the contractor may use other types of cements conforming to IS: 269, IS: 8112, IS: 12269, & IS: 455.	Cement Fly ash based portland pozzolana cement conforming to IS:1489 (Part-1) shall be used for all areas other than for the critical structures identified below. Other properties shall be as per IS code. Ordinary Portland Cement (OPC) shall necessarily be used for the following structures. a) Spring supported decks of limestone crusher b) RCC for Chimney shell. The grade of cement shall be Grade 43 for OPC conforming to IS:8112. In place of fly ash based portland pozzolana cement, OPC mixed with Fly Ash can be used. Batching plant shall have facility for mixing fly ash. Fly ash shall conform to IS:3812(Part I & Part II). Percentage of fly ash to be mixed in concrete shall be based
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						on trial mix. Mix design shall be done with varying percentage of fly ash mix with cement.
30.	Secti on VI / Part B	Sub- Section-IV- D Civil Works	39.05.00 ,	66 of 69	-	Aggregates a) Coarse Aggregate Coarse aggregate for concrete shall be crushed stones chemically inert, hard, strong, durable against weathering of limited porosity and free from deleterious materials. It shall be properly graded. It shall meet the requirements of IS: 383. b) Fine Aggregate Fine aggregate shall be hard, durable, clean and free from adherent coatings of organic matter and clay balls or
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						pellets. Fine aggregate in concrete shall conform to IS : 383. For plaster, it shall conform to IS : 1542 and for masonry work to IS : 2116. c) Petrographic examination of aggregate shall be carried out by the contractor at National Council for Cement and Building Materials (NCB), Ballabgarh, or any other approved laboratory to ascertain the structure and rock type including presence of strained quartz and other reactive minerals. In case, the coarse aggregate sample is of composite nature, the proportions (by weight) of different rock types in the composite sample and petrographic evaluation of each rock should also be ascertained. While determining the rock type, special emphasis should be given on identification of known reactive rocks like

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						chalcedony, opal etc. The procedure laid down in IS 2430 for sampling of aggregates may be followed. The laboratory shall determine potential reactivity of the aggregate, which may lead to reaction of silica in aggregate with the alkalis of cement and / or potential of some aggregates like limestone to cause residual expansion due to repeated temperature cycle. If the same is established, the contractor shall further carry out alkali aggregates reactivity test as per IS 2386 (Pt.VII) and / or repeated temperature cycle test to establish the suitability of the aggregates for the concrete work. The test results, with the final recommendations of the laboratory, as to a suitability of the aggregate, for use in the concrete work for various structures and suggested measures, in case of results

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						are not satisfactory, shall be submitted to the Engineer for his review, in a report form. In case in the report, it is established, that the aggregates contain reactive silica, which would react with alkalis of the cement, the contractor shall change the source of supply of the aggregate or use low alkali cement as per recommendation or take measures as recommended in the report as instructed by Engineer. In case aggregates indicate residual expansion, under repeated temperature cycle test (from 10° Celsius to 65° Celsius and for 60 temperature cycles) the material shall not be used for concreting of Lime stone crusher decks, Mills, Fans and other equipment foundations which are likely to be subjected to repeated

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
						temperature cycle. The contractor shall use aggregates free from residual expansion under repeated temperatures cycle test.
31.	Secti on VI / Part B	Sub-Section-IV- D Civil Works	8.00.00, Para-3	26 of 69	Bricks to be used in brickwork shall be of minimum Class designation 50.	Only fly ash bricks shall be used in all construction. Bricks shall be table moulded/ machine made of uniform size, shape and sharp edges and shall have minimum compressive strength of 75kg/cm ² . Burnt clay fly ash bricks and fly ash lime bricks shall conform to IS 13757 and IS 12894 respectively. Minimum fly ash content in fly ash based bricks shall be 25%.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
32.	SECTION - VI, PART-B	SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	9.05.00	19 of 27	Bidder shall clearly bring out in the proposal the redundancy feature along with configuration diagram, single line diagram and datasheets etc. & this shall be finalized subject to approval during detail engineering. Configuration B : UPS system shall consist of 1 x 100% charger and inverter with input isolation transformer, 1 x 100% Ni Cd Battery Bank for 1 hour, Bypass Line and Voltage Stabilizer, static switch, manual bypass switch, 2 x 100% ACDB, 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS) and other necessary protective devices and accessories. Scheme of UPS system Configuration-B Drg. no. 0000-999-POI-A-019C	Bidder shall clearly bring out in the proposal the configuration diagram, single line diagram and datasheets etc. & this shall be finalized subject to employer's approval during detail engineering. Configuration B : UPS system shall consist of 1 x 100% charger and inverter with input isolation transformer, 1 x 100% Ni Cd Battery Bank for 1 hour, Bypass Line Transformers and Voltage Stabilizer, static switch, manual bypass switch, 2 x 100% ACDB, 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS) and other necessary protective devices and accessories. UPS Configuration-B drawing 0000-999-POI-A-019C updated.
	SECTION - VI, PART-T-E	Tender drawing C&I		18 of 53 (of PDF)		

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
33.	SECTION – VI, PART-A	SUB-SECTION- IIIC C&I	New clause 1.00.00 e)	1 of 8		1.00.00 e) Scope defined in PART-A read in conjunction with PART-B has to be provided for each station (i.e. 11 sets for 11 stations) under LOT-1A package. The scope detailed hereunder in the following clauses is for one set.
34.	SECTION – VI, PART-T-E	Tender drawing C&I		13 of 53 (of PDF)	Standard configuration drawing for PLC based offsite control system. Tender drawing no. 0000-151-POI-A-013 (Rev no. A).	Standard configuration drawing for PLC based offsite control system. Tender drawing no. 0000-151-POI-A-013 (Rev no. B).
35.	SECTION – VI, PART-A	SUB-SECTION- IIIC C&I	New clause 2.07.00	4 of 8	-	2.07.00 Contractor shall provide one no. of Hand held HART calibrator per generating unit.

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36.	SECTION – VI, PAR T-A	SUB-SECTION- III C&I	New clause 6.08.00	7 of 8	-	6.08.00 Binary and modulating controls of complete Flue gas desulphurization system, associated material handling systems etc. and other systems being provided under the contract shall be implemented in PLC. The PLC based Control System shall have separate process blocks for unitised system and one process block for common system including material handling system. For example in KUDGL-I (3x800MW), the PLC based control system shall have following process blocks: (i) Unit-1 FGD and associated system (ii) Unit-2 FGD and associated system (iii) Unit-3 FGD and associated system (iv) Common system including material handling systems.
37.	SECTION – VI, PAR T-B	SUB-SECTION-III- C2, MEASURING INSTRUMEN TS	8.00.00	16 OF 34	Coriolis Flow Transmitter: Viscosity range of Fluid 0-500cst for HFO.	Coriolis Flow Transmitter: Viscosity range of Fluid 0-500cst for HFO.

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38.	SECTION – VI, PART-A	SUB-SECTION- III C&I	6.01.00	7 of 8	6.01.00 on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of PLC and Human Machine Interface system (EWS cum OWS). The PLC configuration drawing.....	6.01.00 on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of PLC and Human Machine Interface system (EWS cum OWS). However, bidder to consider minimum quantity of OWS and OWS cum EWS as follows: a) OWS (placed in FGD control room)-(N+1) where N is the total number of generating units per project under this package. b) OWS cum EWS (placed in FGD control room)-ONE (1) c) OWS (placed in central control room of each generating unit)-TWO (2). The PLC configuration drawing.....

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
39.	SECTION – VI, PAR T-A	SUB-SECTION-III C&I	New clause 6.09.00	7 of 8	-----	6.09.00 The Bidder shall provide maintenance services of complete control System under a comprehensive Annual Maintenance Contract (AMC) for period of three year after Warranty period.
	SECTION – VI, PAR T-B	SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	16.01.00	26 of 27	16.01.00 The Bidder shall provide maintenance services of complete control System under a comprehensive Annual Maintenance Contract (AMC) for period of one year after Warranty period and thereafter AMC for only hardware support for next two years.	16.01.00 The Bidder shall provide maintenance services of complete control System under a comprehensive Annual Maintenance Contract (AMC) for period of three year after Warranty period.
40.	SECTION – VI, PAR T-E	Tender drawing C&I		19 and 20 of 53 (of PDF)	Instrumentation/control/power supply cabling diagram Drg No. 0000-101/102-POI-A-021 Sheet 1 of 3 and sheet 2 of 3	Instrumentation/control/power supply cabling diagram Drg No. 0000-101/102-POI-A-021 Sheet 1 of 3 and sheet 2 of 3 updated.

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41.	SECTION – VI, PART-A	SUB-SECTION- III C&I	7 of 8	New clause 6.10.00	-	6.10.00 Contractor shall provide control desk placed in FGD control room, meeting specification requirements stipulated in clause 10.04.00, PART-B, Sub Section III-C5 of technical specification. Contractor shall also provide a control desk for each generating unit, of length 2 meter aesthetically matching with the existing control desk of main plant Central Control Room (CCR) for placing FGD OWS in main plant CCR.
42.	SECTION – VI, PART-E	Tender drawing		5 of 53 (of PDF) 6 of 53 (of PDF)	Tender drawing no. 0011-109-POM-A-001(a): Scheme of FGD Absorber system (Single unit) Tender drawing no. 0011-109-POM-A-001: Scheme of FGD Absorber system (For two units)	NOTE 13 and 17 deleted NOTE 13 and 17 deleted

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43.	SECTION – VI, PART-A	SUB-SECTION-IV Terminal points and exclusions	1.14.00	3 of 3	1.14.00 Control & Instrumentation a) Employer's marshalling cabinets for hardwired signal exchange with Employer system. b) Instrument air at one point (if required). c) One (1) no. 240V, single phase, 50 Hz feeder per unit for meeting the unregulated AC power supply requirement for illumination, heating, ventilation, and utility outlets, etc. at bidder's Power supply distribution panel. d) Two (2) 415 V, 3 – phase 3 wire, 50 Hz feeder for each set of the bidder's 24 V DC system.	1.14.00 Control & Instrumentation a) Employer's marshalling cabinets for hardwired signal exchange with Employer system. b) Employer's station wide LAN switch. c) One (1) no. 240V, single phase, 50 Hz feeder per unit for meeting the unregulated AC power supply requirement for illumination, heating, ventilation, and utility outlets, etc. at bidder's Power supply distribution panel.
44.	SECTION – VI, PART-B	SUB-SECTION-III-C2, MEASURING INSTRUMENTS	11.07.00 Note 1	30 OF 34	NOTES:- 01. Hot extractive sampling type/ Dilution extractive type systems shall be provided with dual sample probes along with all required accessories such as	NOTES:- 01. Hot extractive sampling type/ Dilution extractive type systems shall be provided with dual sample probes along with all required accessories such as
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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
					as redundant heavy duty pumps with continuous rated motors, moisture detection facility, pre-fabricated heated (for sampling type only) sample lines from probes to analyser panel, solenoid valves, filters, coolers along with level switch in gas coolers for auto draining purpose and flow meter for auto draining purpose and flow meter etc as applicable. Alternatively, permeation based dryer (located near the tapping point) may also be provided in place of sample cooler.	redundant heavy duty pumps with continuous rated motors, moisture detection facility, pre-fabricated heated (for sampling type only) sample lines from probes to analyser panel, solenoid valves, filters, coolers along with level switch in gas coolers for auto draining purpose and flow meter etc as applicable. Alternatively, permeation based dryer (located near the tapping point) may also be provided in place of sample cooler.
45.	SECTION - VI, PART-A	SUB-SECTION-VII, Mandatory Spares	1.25.00	45 of 61	1.25.00 CONTROL AND INSTRUMENTATION	1.25.00 CONTROL AND INSTRUMENTATION (EXCLUDING AIR CONDITIONING AND VENTILATION SYSTEM, COMPRESSED AIR SYSTEM, FIRE DETECTION AND PROTECTION SYSTEM. For mandatory spare of these systems, refer mandatory spare clauses specified under respective systems)

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46.	SECTION – VI, PAR T-A	SUB-SECTION-III C&I	6.07.00	7 of 8	UPS of suitable capacity for the intended application meeting the requirements of Technical Specifications as per Cl. No. 9.05.00, Part B, III-C5. Contractor to note that UPS of configuration C is acceptable only upto 5 KVA. In case the consolidated load requirements.....	UPS of suitable capacity for the intended application meeting the requirements of Technical Specifications as per Cl. No. 9.05.00, Part B, III-C5. Contractor shall provide Mini UPS for 01 (one) no. of OWS cum EWS. Contractor to note that UPS of configuration C is acceptable only upto 5 KVA. In case the consolidated load requirements.....						
47.	SECTION – VI, PAR T-A	SUB-SECTION-III C&I	New clause 6.11.00	7 of 8	-	Output redundancy is applicable for 10% of drives distributed in various functional groups (Exact application shall be finalized during detailed engineering).						
48.	SECTION – VI, PAR T-B	SUB-SECTION-III-C2 MEASURING INSTRUMENTS	2.01.00 (16)	3 of 34	<table><tr><td>16.</td><td>Adjustment/calibration/maintenance</td><td>From hand held HART calibrator/centralized PC based system (as applicable).</td></tr></table>	16.	Adjustment/calibration/maintenance	From hand held HART calibrator/centralized PC based system (as applicable).	<table><tr><td>16.</td><td>Adjustment/calibration/maintenance</td><td>From hand held HART calibrator/centralized PC based system (as applicable).</td></tr></table>	16.	Adjustment/calibration/maintenance	From hand held HART calibrator/centralized PC based system (as applicable).
16.	Adjustment/calibration/maintenance	From hand held HART calibrator/centralized PC based system (as applicable).										
16.	Adjustment/calibration/maintenance	From hand held HART calibrator/centralized PC based system (as applicable).										
49.	Part B (1)– Section VI	Sub Section-I-M1	6.02.03	21 of 51	Each silo shall be provided with sufficient no. of level transmitters.	Each Silo shall be provided with minimum 02 no. of Level transmitters per silo.						

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50.	SECTION - VI, PART-A	SUB SECTION VI	S.No xii , CL.NO. 5.00.00	21 of 24	DM COOLING (NORMALLY WORKING) WATER PUMP ONE (1) TO SUPPLY COOLING WATER ON THE PRIMARY (DM) SIDE OF THE PLATE TYPE HEAT EXCHANGER IN THE CLOSED LOOP EQUIPMENT COOLING WATER SYSTEM.	FGD DM (Primary) Cooling water pump (all working pumps) to supply cooling water on the primary (DM) side of the plate type heat exchanger in the closed loop equipment cooling water system.
51.	SECTION - VI, PART-A	Sub section VI	S.No xiii CL.NO. 5.00.00,	21 of 24	AUXILIARY COOLING (NORMALLY WORKING) WATER PUMP ONE (1) TO SUPPLY COOLING WATER ON THE SECONDARY SIDE OF THE PLATE TYPE HEAT EXCHANGER IN THE CLOSED LOOP EQUIPMENT COOLING (UNIT AUXILIARY) WATER SYSTEM.	FGD Auxiliary (Secondary) Cooling water pumps (all working pumps) to supply cooling water on the secondary side of the plate type heat exchanger for FGD equipment cooling water system.

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52.	SECTION - VI, PART-A	Sub section IV	1.06.00	2 of 3	FOR GYPSUM WASHING, CONTRACTOR SHALL TAKE A TAP OFF SUITABLY FROM THE EXISTING HVAC HEADER (HVAC MAKE UP PUMP DISCHARGE) AVAILABLE ALONG C-ROW AT CD BAY RACK FOR MEETING THE WATER REQUIREMENT OF GYPSUM WASHING. THE PRESSURE AVAILABLE AT TP WILL BE 4 KSC (GAUGE) WRT FGL (APPROX.).	For Gypsum washing, contractor shall take a tap off suitably from the existing HVAC header (HVAC make up pump discharge) available along C-row at CD bay rack for meeting the water requirement of gypsum washing. The water quantity and pressure available at TP will be 20m3/hr & 4 Ksc (gauge) wrt FGL (approx.) respectively.
53.	VI Part-A	III-A5	1.02.01	1 of 6	Based on site visit, bidder shall submit layout for Limestone handling plant & Gypsum handling facilities along with their techno-commercial bid. Bidder shall bring out all necessary modification and relocation of existing facilities, if required, along with proposed Layout submitted with the bid. <i>In the absence of this, the bid shall be deemed incomplete and may be liable for rejection.</i>	Based on site visit, bidder shall submit layout for Limestone handling plant & Gypsum handling facilities along with their techno-commercial bid. All required modification and demolition work of existing facilities shall be in the bidder's scope. However if any relocation of existing facility is required, the same shall be done by the employer. Bidder shall bring out all necessary modification and relocation of existing facilities, if

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						required, along with proposed Layout submitted with the bid. <i>In the absence of this, the bid shall be deemed incomplete and may be liable for rejection.</i>
54.	Secti on- VI, Part A	III-A5	2.01.01	2 of 6	Lime stone received through Road shall be unloaded by Two (2) numbers Truck Tipplers each of minimum 20T capacity to discharge Limestone on to Box Feeders/ Truck Surface Feeders/ Truck Unloading Hopper, complete with all mechanical, electrical and C&I, civil & structural works for unloading Limestone by truck tipplers. TWO (2) NUMBERS BOX FEEDERS/ BULK-MATERIAL RECEIVING UNIT/ UNDERGROUND TRUCK UNLOADING HOPPER / SURFACE FEEDER, FOR UNLOADING OF LIMESTONE FROM TRUCKS/ SELF-TIPPLING TRUCKS/ LOADER SHOVELS, COMPLETE WITH	Lime stone received through Road shall be unloaded by Two (2) numbers Truck Tipplers each of minimum 40T capacity (Gross weight 60 T minimum) to discharge Limestone on to Box Feeders/ Surface Feeders/ Truck Unloading Hopper, complete with all mechanical, electrical and C&I, civil & structural works for unloading Limestone by truck tipplers. Two (2) numbers Box Feeders/ Bulk-material Receiving Unit/ ~~Underground Truck Unloading Hopper~~ / Surface feeder, for unloading of limestone from trucks/ self-tipping trucks/ loader shovels, complete with drives, accessories all mechanical, electrical and C&I, Civil & structural works, including its

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					DRIVES, ACCESSORIES ALL MECHANICAL, ELECTRICAL AND C&I, CIVIL & STRUCTURAL WORKS, INCLUDING ITS SUPPORTING FOUNDATIONS ETC. THIS UNIT SHALL FEED LIMESTONE ONTO THE CONVEYOR BEFORE LIMESTONE CRUSHER HOUSE.	supporting foundations etc. This unit shall feed limestone onto the conveyor before Limestone crusher house.
55.	--	--	--	--	Vibrating Feeder	Vibrating Screening Feeder
					Vibrating (Grizzly/Screening) Feeder	
					Vibrating Grizzly/Screening Feeder	
					Vibrating grizzly Feeders	
					Vibrating Screen Feeder	

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56.	Secti on- VI, Part A	III-A5	2.01.07	3 of 6	Crushed limestone Reclaim Hopper (RH) /Silo..... For Limestone storage shed and for all buildings, other equipment such as DS system, ventilation system, drinking water system, drainage system etc. as specified elsewhere in the specification.	Crushed limestone Reclaim Hopper (RH) /Silo..... For Limestone storage shed and for all buildings, other equipment such as Dry type Dust Extraction system, ventilation system, drinking water system, drainage system etc. as specified elsewhere in the specification.
	Secti on- VI, Part B	I-M6	4.11.3 (v)	15 of 73	The Contractor For specification of dust suppression equipment for paddle feeder, refer relevant Sub-section of this Specification.	The Contractor For specification of Dry type Dust Extraction System for paddle feeder, refer relevant Sub-section of this Specification.
	Secti on- VI, Part B	I-M6	4.13.7	19 of 73	Hoists with monorail of adequate capacity shall be provided in the service water/dust suppression/ potable water pump houses.	Hoists with monorail of adequate capacity shall be provided in the service water/ ~~dust suppression~~ / potable water pump houses.

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57.	Secti on- VI, Part A	III-A5	2.01.28	5 of 6	Minimum one (1) no. Weighing Bridge for Road trucks / Tipplers shall be provided each in Limestone unloading area and in Gypsum Loading area.	Minimum one (1) no. Weighing Bridge of capacity 100 MT for Road trucks / Tipplers shall be provided each in Limestone unloading area and in Gypsum Loading area.
58.	Secti on- VI, Part A	III-A5	2.01.19	4 of 6	One (1) number of passenger cum goods elevator with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of lime stone crusher house.	One (1) number conventional enclosure type passenger cum goods elevator having capacity of 16 persons (1088 kg) complying to IS:14665 (latest edition) with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of lime stone crusher house. Staircase access for machine room shall also be provided by the bidder.

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59.	Secti on- VI, Part A	III-A5	3.03.00	6 of 6	Minimum four (2) Nos. sump pumps in gypsum storage shed complete with motors, local control panel, level switches, individual discharge piping with fittings and valves to nearest plant drain including pipes etc. up to disposal point.	Minimum four (4) Nos. sump pumps in gypsum storage shed complete with motors, local control panel, level switches, individual discharge piping with fittings and valves upto Bottom Ash Slurry Sump.
60.	Secti on- VI, Part A	III-A5	2.01.11	3 of 6	One number of covered storage shed for crushed limestone. The storage shed shall be sufficient to store limestone equivalent to consumption of minimum 7 days at Design point (Generation of all units to be considered). A reclaim hopper shall be provided below the limestone storage shed for the entire length of the stockpile. Alternatively, suitable number of Limestone Storage Silos to store limestone equivalent to consumption of minimum 7 days. Suitable number of Belt feeders below silos shall be	One number of covered storage shed for crushed limestone. The storage shed shall be sufficient to store limestone equivalent to consumption of minimum 7 days at Design point (Generation of all units to be considered) or 5000 MT (wherever Railway Rake unloading is envisaged) whichever is higher. A reclaim hopper shall be provided below the limestone storage shed for the entire length of the stockpile. Alternatively, suitable number of Limestone Storage Silos to store limestone equivalent to consumption of minimum 7 days at Design point or 5000 MT

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					provided taking feed from silo and discharging onto onward conveyors/ Bucket elevators.	(wherever unloading is envisaged) whichever is higher. Suitable number of Belt feeders below silos shall be provided taking feed from silo and discharging onto onward conveyors/ Bucket elevators.
61.	Secti on- VI, Part A	VI	5.00.00	20 of 24	AUXILIARY POWER CONSUMPTION(PA) FOR EACH PROJECT The unit auxiliary power consumption xxix. Power consumption of Mechanical vapour Compressor divided by the number of units in the projects, in case ZLD system is provided The equipment's listed above for calculating..... power consumption.	AUXILIARY POWER CONSUMPTION(PA) FOR EACH PROJECT The unit auxiliary power consumption xxix. Power consumption of Mechanical vapour Compressor divided by the number of units in the projects, in case ZLD system is provided. xxx. a) Power consumption of lime stone unloading, conveying, crushing , storage & reclaiming system (Single stream) except Lighting, Hoists, sampling unit, Sump Pumps,

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					Note: - The bidder.....approva l. - The equipments..... consumption.	Elevators, DE, Ventilation, SW System, Potable water system – for road unloading system (if only road unloading system is provided) or b) Power consumption of lime stone conveying (starting from feed point from existing Coal Handling Plant), crushing, storage & reclaiming system (Single stream) except Lighting, Hoists, sampling unit, Sump Pumps, Elevators, DE, Ventilation, SW System, Potable water system – for Indian Railway's unloading system. xxxi. Power consumption of Gypsum conveying system (Single Stream) except Lighting, Hoists, sampling unit, Sump Pumps, Elevators, DE, Ventilation, SW System, Potable water system. The equipment's listed above for calculating.....po
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						wer consumption. Note: 1. The bidder.....approval. The equipments..... consumption.
62.	Secti on- VI, Part A	V	10.00.00	21 of 26	LIMESTONE HANDLING PLANT	LIMESTONE AND GYPSUM HANDLING PLANTS
63.	Secti on- VI, Part A		10.01.00	21 of 26	Rated capacity of Limestone handling system from existing CHP shall be 1200 TPH upto crushed limestone storage system. Belt speed of conveyors shall not be more than 3.4 m/s.	a. Rated capacity of Limestone handling system from existing CHP shall be 1200 MTPH upto crushed limestone storage system. Rated capacity of all other Limestone Handling Conveyors shall be 150 MTPH (min). b. Rated capacity of Limestone handling system for truck unloading and reclaim conveyors from storage shed/silo to limestone mill bunkers shall be 150 MTPH (min).
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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
						c. The rated capacity of all Gypsum handling conveyors shall be 150MTPH. Belt speed for 1200 MTPH conveyors shall not be more than 3.4 m/s, and belt speed for 150 MTPH conveyors shall not be more than 2.0 m/s
64.	Secti on- VI, Part A	V	10.02.00	21 of 26	All conveyors shall be designed for 110% of rated capacity. Rated capacity (corresponding to CHP capacity) shall be guaranteed capacity for 100% duty equipment. For 50% duty equipment design capacity shall be guaranteed capacity. For purpose of guaranteed power consumption rated capacity shall be considered in either case.	All conveyors shall be designed for 110% of rated capacity. Rated capacity (corresponding to LHP&GHP capacity) shall be guaranteed capacity for 100% duty equipment. For 50% duty equipment design capacity shall be guaranteed capacity. 1. For purpose of guaranteed power consumption rated capacity shall be considered in either case.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
65.	Secti on- VI, Part A	V	10.03.00	21 of 26	2x100 %(one working + one standby) conveying stream shall be provided in the CHP .	2x100 %(one working + one standby) conveying stream shall be provided in the LHP&GHP .
66.	Secti on- VI, Part A	V	10.06.00 e)	22 of 26	e) The following aspects shall be taken care of coal / limestone: i) The limestone delivered to power station shall be of size 250mm and below. However, occasionally 1-2% limestone of 400 mm lump size may also be encountered. ii) Due to open cast method of mining involved, the limestone may contain shale and sand stone as high as 20%. Also occasionally, metal pieces like broken shovel teeth, brake shoe, wires etc. may also come along with limestone. iv) The limestone as received' shall contain varying percentage of fines. This may form adhesive lumps particularly during monsoon when surface moisture is at its	e) The following aspects shall be taken care of limestone: i) The limestone delivered to power station shall be of size 250mm and below. However, occasionally 1-2% limestone of 400 mm lump size may also be encountered. ii) Due to open cast method of mining involved, the limestone may contain shale and sand stone as high as 20%. Also occasionally, metal pieces like broken shovel teeth, brake shoe, wires etc. may also come along with limestone. iv) The limestone as received' shall contain varying percentage of fines. This may form adhesive lumps particularly during monsoon when surface moisture is at its

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
					percentage of fines. This may form adhesive lumps particularly during monsoon when surface moisture is at its maximum value. The sizing and selection of all equipment shall take care of above.	maximum value. The sizing and selection of all equipment shall take care of above.
67.	Secti on- VI, Part A	V	10.08.00	22 of 26	Drive equipment Rating Continuous Motor Rating (Name Plate Rating) at 50 Degree Centigrade Ambient temp. for Electric Motors a) For conveyors of belt conveyor systems *120% of actual power at drive motor output shaft at specified design capacity 	Drive equipment Rating Continuous Motor Rating (Name Plate Rating) at 50 Degree Centigrade Ambient temp. for Electric Motors a) For conveyors of belt conveyor systems *110% of actual power at drive motor output shaft at specified design capacity

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
68.	Secti on- VI, Part A	V	10.11.00	23,24 of 26	Belting and Pulleys for 1200 TPH Belting and Pulleys for 150TPH rated conveying capacity (LHP &GHP) (a)..... (b)..... (c)..... (d) Maximum type of pulleys permitted based on pulley diameter and shaft diameter shall be limited to three (3) nos. These shall comprise of two (2) nos. drive pulleys & one (1) no. for all balance pulleys excluding tripper & SS pulleys.	Belting and Pulleys for 1200 TPH Belting and Pulleys for 150TPH rated conveying capacity (LHP &GHP) (a)..... (b)..... (c).....

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69.	Secti on- VI, Part A	V	10.13.00	24 of 26	2x100 %(one working + one standby) conveying stream shall be provided in the limestone and gypsum handling system.	Maximum type of pulleys permitted based on pulley diameter and shaft diameter shall be limited to five (5) nos. These shall comprise of two (2) nos. drive pulleys & three (3) no. for all balance pulleys excluding tripper & SS pulleys.
70.	Secti on- VI, Part A	V	10.14.00	24 of 26	The covered storage shed/silo for limestone shall be sufficient to store limestone equivalent to consumption of minimum 7 days. The covered storage.....7 days. Further approval..... of the pulley diameters. Maximum type of pulleys permitted based on pulley diameter and shaft diameter shall be limited to five (5). These shall comprise of two (2) nos. drive pulleys and three (3) nos. for all balance pulleys. Pulleys for Belt	The covered storage shed/silo for limestone shall be sufficient to store limestone equivalent to consumption of minimum 7 days at Design point (Generation of all units to be considered) or 5000 MT (wherever Railway Rake unloading is envisaged) whichever is higher. The covered storage.....7 days. At least One third (1/3 rd) of total stipulated crushed limestone storage shall be considered in the hopper, if applicable, and hopper length shall be equal to stockpile
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					Feeder, fixed & travelling tripper, SS pulleys & S/R pulleys are not included in the above categories.	length placed along the tripper centerline. Further approval..... of the pulley diameters.
71.	Secti on- VI, Part A	V	10.15.00	25 of 26	Dust extraction system Type: Venturi scrubber type Location: Belt feeder after crusher & Vibrating Screening Feeder at crusher house.	Dust extraction system Type: Venturi scrubber type Location: Truck un-loading points, Junction Towers (limestone/ gypsum discharge & receipt points), limestone crusher house (including belt feeder & vibrating screening feeder) and lime stone/gypsum storage Shed/Silo.

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72.	Secti on- VI, Part A	V	10.18.00	25 of 26	Chutes: Minimum clear cross section of chute: 1000 mm X 800 mm (inside both ways) Chutes: Minimum clear cross section of chute: 1000 mm X 800 mm (inside both ways) for 1200 mm Belt Width. Minimum clear cross section of chute: 900 mm X 600 mm (inside both ways) for 800 mm Belt Width.	
73.	Secti on- VI, Part A	V	11.00.00 11.01.00 11.02.00 11.03.00 11.04.00 11.05.00	25 of 26 & 26 of 26	LIMESTONE HANDLING PLANT AND GYPSUM HANDLING PLANT 	Deleted
74.	Secti on- VI, Part B	I-M6	1.0.0	1 of 73	INTRODUCTION This section of the specification provides the detailed technical requirements for the Limestone Handling System.	INTRODUCTION This section of the specification provides the detailed technical requirements for the Limestone & Gypsum Handling System.
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75.	Section VI, Part B	I-M6	Footer	All Pages	SUB-SECTION-I-M6 LIMESTONE HANDLING PLANT(LHP)	SUB-SECTION-I-M6 LIMESTONE AND GYPSUM HANDLING PLANT(LHP & GHP)
76.	Section VI, Part B	I-M6	3.3.0	3 of 73	In limestone crusher house, limestone from each incoming Conveyor shall pass through two (2) numbers of (dedicated) Vibrating grizzly/ screening Feeders and two (2) numbers of (dedicated) crushers respectively which shall crush limestone to (-) 20mm size or to suit limestone pulverizer and system..... in limestone crusher house.	In limestone crusher house, limestone from each incoming Conveyor shall pass through one (1) or two (2) numbers, as applicable, of (dedicated) Vibrating ~~grizzly/~~ screening Feeders and one (1) or two (2) numbers, as applicable, of (dedicated) crushers respectively which shall crush limestone to (-) 20mm size or to suit limestone pulverizer and system..... in limestone crusher house.
77.	Section VI, Part B	I-M6	4.0.0	3 of 73	MAJOR EQUIPMENT OF LIMESTONE HANDLING SYSTEM AND GYPSUM HANDLING SYSTEM Specifications for Coal Handling system equipments shall be generally followed for Lime Handling System & Gypsum handling System	MAJOR EQUIPMENT OF LIMESTONE HANDLING SYSTEM AND GYPSUM HANDLING SYSTEM
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					unless specified otherwise.	
78.	Secti on- VI, Part B	I-M6	4.1.1	4 of 73	Belting: The belting shall be of either synthetic fabric such as Nylon- Nylon etc. with rubber covers of adequate flexibility to give a troughing angle of 35 deg. For all the conveyors the number of plies, cover thickness, factor of safety etc. shall be as per the recommendation of belt manufacturer, but not inferior to the figures as tabulated in data sheet. <i>Longitudinal joints in the plies of synthetic fabric belts is not permitted.</i>	Belting: The belting shall be of either synthetic fabric such as Nylon- Nylon etc. with rubber covers of adequate flexibility to give a troughing angle of 35 deg. Belt Width : 800 mm (Min) for 150 MTPH 1200 mm (Min) for 1200 MTPH For all the conveyors the number of plies, cover thickness, factor of safety etc. shall be as per the recommendation of belt manufacturer, but not inferior to the figures as tabulated in data
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79.	Secti on- VI, Part B	I-M6	4.5.3	9 of 73	 Alternatively, Air cooled type scoop coupling is also acceptable for all conveyors with HT motors for (AHP, LHP, GHP) and crusher scoop couplings. Suitable interlock.....	sheet. Longitudinal joints in the plies of synthetic fabric belts is not permitted. Alternatively, Air cooled type scoop coupling is also acceptable for all conveyors with HT motors for (AHP, LHP, GHP) and crusher scoop couplings. Suitable interlock.....
80.	Secti on- VI, Part B	I-M6	4.6.4	10 of 73	New Clause	All vertical steel members (in Junction Towers/Transfer Points and Crusher House) supporting the conveyors, equipment shall be mounted on 150MM concrete pedestals above floor level to avoid their direct contact with water.
81.	Secti on- VI, Part C	GTR	30.00.00	42 of 83	NOISE LEVEL The equivalent 'A' weighed sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/machine, furnished and	NOISE LEVEL The equivalent 'A' weighed sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/machine, furnished and

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					equipment/machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA. However for Balls Mills the noise levels as per following shall also be acceptable: a) Ball Mill <90 dBA	installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA. However for Balls Mills and limestone crusher the noise levels as per following shall also be acceptable: a) Ball Mill <90 dBA b) Limestone Crusher <90 dBA
82.	SECTION - VI, PART A	SUB-SECTION- III-B ELECTRIC AL SYSTEM/EQUIPMENT	1.15.00	5 of 6	-----	Power supply arrangement for FGD system has been indicated in the Single line diagrams tender SLD 0011-109-POE-J-001 A/B/C attached at Part-E section VI of the technical specifications. Id booster fans (largest 11kW motor, Max. 2 Nos. per unit) shall be fed from spare panels available in existing station switchgear in each project. The spare feeders which have been identified for this purpose in each of the projects are indicated in the table attached at Annexure-E1 to this document. Any augmentation required in the
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						switchgear panels for this purpose (conversion from Transformer feeder to Motor feeder, change in CT rating Etc.) required for making the panel suitable for above use shall also be in the scope of bidder. Other FGD loads (except indicated above) shall be fed by creating new 11kV FGD tie switchgear and subsequent additional voltage levels as required. The feeders currently being used for feeding ESP standby transformer (ESP Trf #G/H) shall be used for extending power supply from station board to 11kV FGD Tie switchgear. If the rating of the VCB in this panel in station switchgear is less than 1600A, VCB shall be replaced by new 1600A VCB for this purpose. Other necessary augmentation in panel for conversion from transformer feeder to TIE feeder, change in CT rating etc. required for making the panel suitable for the above use shall also be in scope of bidder. Entire cabling
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						and re-cabling required as per the above scheme shall be in bidder's scope. Bidder will be required to feed the ESP standby transforms from this new FGD Tie switchgear. In case of Nabinagar 4x250MW project feeding shall be as indicated in Single line diagrams tender SLD 0011-109-POE-J-001 C. In this case ID booster fans along with all other FGD loads shall be fed from 6.6kV FGD Tie switchgear (one set for two units each). The feeders currently being used for feeding ESP standby transformer (ESP Trf #C) shall be used for extending power supply from station board to 6.6kV FGD Tie switchgear.

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83.	SECTION - VI, PART E	III A-1	1.00.00	5 of 8	Electrical Single line diagram for FGD Package Drg. no. 0011-109-POE-J-001/A-E	Electrical Single line diagram for FGD Package Drg. no. 0011-109-POE-J-001/A/B/C Revised Drg. is attached at Part-E.
84.	SECTION - VI, PART A	SUB-SECTION- III-B ELECTRIC AL SYSTEM/ EQUIPMEN T	1.02.00	1 of 6	HT/ LT SWITCH GEAR HT and 415V Switchgear / Motor control centers (as shown in Electrical Single Line Diagram Drg No. 0011-109-POE-J-001) Busduct / Cable (as applicable), distribution boards, AC/DC fuse boards, LDB, local emergency push button stations for all drives energized from MCC's under contractor scope and local motor starters (for ventilation fans) as required for plant and equipment in contractor's scope.	HT/ LT SWITCH GEAR HT and 415V Switchgear / Motor control centers (as shown in Electrical Single Line Diagram Drg No. 0011-109-POE-J-001) Busduct / Cable (as applicable), distribution boards, AC/DC fuse boards, LDB, local emergency push button stations for all drives and local motor starters (for ventilation fans) as required for plant and equipment in contractor's scope. HT Switchgear- All HT switchboards shall be provided with one spare motor feeder and one transformer feeder on each

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						section as spares. LT Switchgear- All LT Switchgears, Motor Control Centers (MCCs) & AC/DC distribution boards, etc. shall have at least twenty per cent (20%) or minimum two (whichever is higher) fully equipped switch fuse modules of each rating as spares, uniformly distributed over different vertical sections. In addition, all LT Switchgears, MCCs and AC distribution boards shall have as spares at least twenty per cent (20%) of starter modules/MCCB modules or at least one module (whichever is higher) of each rating range of the selection tables (Clause no.43.00.00) of Tech. Specification Part-B, Sub-Section E-10, equipped for the rating of the largest auxiliary fed from that range.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
85.	SECTION - VI, PART-A	SUB-SECTION-III-B ELECTRIC AL SYSTEM/ EQUIPMEN T	1.02.00	1 of 6	DC SYSTEM Battery and Battery Charger Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for plant and equipment in the scope of the contractor, as per system requirement. The DC system (Battery and Charger) shall be supplied to cater to various DC loads in the plant. The design and sizing criteria shall be as detailed out in the chapter B-0 Part-B of Technical specifications	DC SYSTEM Battery and Battery Charger Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for plant and equipment in the scope of the contractor, as per system requirement. The DC system (Battery and Charger) shall be supplied to cater to various DC loads in the plant. The design and sizing criteria shall be as detailed out in the Sub-section-II- E1 Part-B of Technical specifications
86.	SECTION - VI, PART-B	SUB-SECTION-II-E1 GENERAL ELECTRIC ALSPECIFIC CATION	2.01.01	3 of 7	Adequate number of auxiliary transformers shall be provided to meet the demand on 11kV, 3.3KV and 415V systems under most onerous conditions, with the criteria that each 11kV / 3.3KV / 415 V switchgear / MCC / DB shall be fed by 2x100% or 3 X 50 %, 3x100% transformers / feeders, and these shall be rated to carry the maximum	Adequate number of auxiliary transformers shall be provided to meet the demand on 11kV, 3.3KV and 415V systems under most onerous conditions, with the criteria that each 11kV / 3.3KV / 415 V switchgear / MCC / DB shall be fed by 2x100% or 3 X 50 %, these shall be rated to carry the maximum load expected to

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					load expected to be imposed.	be imposed.
87.	SECTION – VI, PART-B	SUB-SECTION-II-E1 GENERAL ELECTRIC ALSPECIFICATION	2.02.00	3 of 7	MV Switchgears Sizing of HT Switchgears (11kV/3.3kV) shall be in accordance with Clause No. 1.00.00 of Sub-section E9 and its sub-clauses covering sizing criteria, performance / reliability criteria, layout spare capacity requirements, standardization, etc.	MV Switchgears Sizing of HT Switchgears (11kV/3.3kV) shall be in accordance with Clause No. 1.00.00 of Sub-section E9 and its sub-clauses covering sizing criteria, performance / reliability criteria, layout spare capacity requirements, standardization, etc.
88.	SECTION – VI, PART-B	SUB-SECTION-II-E1 GENERAL ELECTRIC ALSPECIFICATION	2.03.00	3 of 7	LV Switchgears Sizing of LT Switchgears shall be in accordance with Clause No. 1.00.00 of Sub-section-II-E10 and its sub-clauses covering design considerations, performance / reliability criteria, spare capacity requirements, standardization, etc.	LV Switchgears Sizing of LT Switchgears shall be in accordance with Clause No. 1.00.00 of Sub-section-II-E10 and its sub-clauses covering design considerations, performance / reliability criteria etc.

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
89.	SECTION - VI, PART-B	SUB-SECTION-II-E1 GENERAL ELECTRIC ALSPECIFICATION	2.03.00	4 of 7	LV Switchgears For 415V system, busduct assemblies shall be used for incoming connection from transformers to the switchboard and interconnecting sections between switchboards wherever transformer rating is 1000KVA or above. However, for transformers of 1000kVA rating, cable connection may also be acceptable in case of layout constraints.	LV Switchgears For 415V system, busduct assemblies shall be used for incoming connection from transformers to the switchboard and interconnecting sections between switchboards wherever transformer rating is 1000KVA or above. However, for transformers of 1000kVA rating, cable connection may also be acceptable in case of layout constraints.
90.	SECTION - VI, PART-B	SUB-SECTION-II-E1 GENERAL ELECTRIC ALSPECIFICATION	2.04.00	4 of 7	Integration with Employer's Switchgear SCADA All MV & LV circuit breakers shall be provided with Communicable Numerical Relays complying with IEC-61850 as specified in Sub-section II-E-09. These relays shall be integrated with Employer's Switchgear SCADA through Ethernet switches (to be supplied by Employer) mounted on each	THIS CLAUSE DELETED.
LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-0011-109(1A)-2						
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					switchgear. The circuit breaker will normally be controlled from remote control panels (DDCMIS) through closing and shunt trip coils. The control of the breakers shall also be possible from the Employer's Switchgear SCADA system.	
91.	SECTION - VI, PART-B	SUB-SECTION-II-E1 GENERAL ELECTRIC AL SPECIFICATION	2.05.00	4 of 7	Control Philosophy The Control Philosophy shall be as follows: (a) All the 11 KV/ 3.3 KV & LT Incoming, Ties, Bus couplers, Transformer feeders shall be controlled from Switchgear SCADA and also from DDCMIS. (b) The motor feeders shall be controlled from the DDCMIS only	Control Philosophy The Control Philosophy shall be as follows: a) All switchgears and MCCs shall be controlled from PLC/DCS.

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92.	SECTION - VI, PAR T-B	SUB-SECTION-II-E9 HT SWITCHG EAR	1.00.00	1 of 39	 Sizing For fault Conditions Fault Level shall be the basic selection Criteria for MV switchgears. Typical Fault ratings are as detailed under Technical parameters (B-0).	 Sizing For fault Conditions Fault Level shall be the basic selection Criteria for MV switchgears. Typical Fault ratings are as detailed under Technical parameters (sub-section-II-E1).
93.	SECTION - VI, PAR T-B	SUB-SECTION-II-E9 HT SWITCHG EAR	1.00.00	2 of 39	Spare capacity and Future Requirements all MV Switchboards is provided with one spare motor feeder and one transformer feeder on each section for future requirements.	 Deleted

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS																																																																		
94.	SECTION – VI, PART-B	SUB-SECTION-II-E9 HT SWITCHGEAR	3.00.00	3 of 39	Technical Parameters	Technical Parameters <table><tr><td>a)</td><td colspan="5">SYSTEM PARAMETERS</td></tr><tr><td>1</td><td>Nominal System voltage</td><td>11 kV</td><td>6.6 kV</td><td>3.3 kV</td><td></td></tr><tr><td>2</td><td>Highest System voltage</td><td>12 kV</td><td>7.2 kV</td><td>3.6 kV</td><td></td></tr><tr><td>3</td><td>Rated Frequency</td><td>50 Hz</td><td>50 Hz</td><td>50 Hz</td><td></td></tr><tr><td>4</td><td>Number of phases/ poles</td><td>Three</td><td>Three</td><td>Three</td><td>Three</td></tr><tr><td>5</td><td>System neutral earthing</td><td colspan="4">Earthed through Resistance to limit fault current to</td></tr><tr><td></td><td></td><td>600A</td><td>600A</td><td>600 A</td><td></td></tr><tr><td>6</td><td>One minute power frequency withstand voltage</td><td colspan="4"></td></tr><tr><td></td><td>- for Type tests</td><td>28</td><td>20</td><td>10</td><td></td></tr><tr><td></td><td>- for Routine tests</td><td>28</td><td>20</td><td>10</td><td></td></tr><tr><td>7</td><td>1.2/50 microsecond Impulse withstand voltage</td><td>75 kV (peak)</td><td>60 kV(peak)</td><td>40 kV(peak)</td><td></td></tr></table>	a)	SYSTEM PARAMETERS					1	Nominal System voltage	11 kV	6.6 kV	3.3 kV		2	Highest System voltage	12 kV	7.2 kV	3.6 kV		3	Rated Frequency	50 Hz	50 Hz	50 Hz		4	Number of phases/ poles	Three	Three	Three	Three	5	System neutral earthing	Earthed through Resistance to limit fault current to						600A	600A	600 A		6	One minute power frequency withstand voltage						- for Type tests	28	20	10			- for Routine tests	28	20	10		7	1.2/50 microsecond Impulse withstand voltage	75 kV (peak)	60 kV(peak)	40 kV(peak)	
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						8	Maximum system fault level including initial motor contribution	40 kA (rms)	40 kA (rms)	40 kA (rms)
						9	Short time rating for bus bars, ckt. breakers, current transformers and swgr. Assembly.	40 kA (rms) for one (1) sec.	40 kA (rms) for one (1) sec.	40 kA (rms) for one (1) sec.
						10	Dynamic withstand rating	100 kA (peak)	100 kA (peak)	100 kA (peak)
						11	IAC Rating	40 KA, 1 sec		
						12	Control supply voltage			
						13	- Trip and closing coils	240V DC	240V DC	240 V DC
						14	- Spring charging motor	240V DC	240V DC	240 V DC
						15	- Space heaters	240 V AC single phase with neutral solidly earthed		

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS																																																																	
						<table><tr><td>1</td><td>Maximum ambient air temperature</td><td>50 deg. C</td><td>50 deg. C</td><td></td></tr><tr><td>2</td><td></td><td></td><td></td><td></td></tr><tr><td>b)</td><td colspan="4">BUS BARS</td></tr><tr><td>1</td><td>Continuous current rating at 50°C ambient:</td><td colspan="3">As Per System requirements and preferably the current ratings shall be 2700 amp, 2500 Amp, 2000Amp, 1600 Amp and 1000 Amp.</td></tr><tr><td>2</td><td>Temperature Rise allowed above ambient</td><td colspan="3">40° C for plain joints 55° C for Silver plated joints.</td></tr><tr><td>c)</td><td colspan="4">SWGR. CUBICLE CONSTRUCTIONAL REQUIREMENTS</td></tr><tr><td>1</td><td>Color finish</td><td colspan="3">RAL9002 (Main body)</td></tr><tr><td></td><td>Exterior</td><td colspan="3">RAL 5012 (Extreme end covers)</td></tr><tr><td>2</td><td>Cable entry</td><td colspan="3"></td></tr><tr><td></td><td>a)</td><td>Power Cables</td><td colspan="2">Bottom</td></tr><tr><td></td><td>b)</td><td>Control Cables</td><td colspan="2">Bottom</td></tr><tr><td>3</td><td>Bus duct entry</td><td colspan="3">Top</td></tr><tr><td>4</td><td>Earthing conductor</td><td colspan="3">Galvanized steel strip</td></tr></table>	1	Maximum ambient air temperature	50 deg. C	50 deg. C		2					b)	BUS BARS				1	Continuous current rating at 50°C ambient:	As Per System requirements and preferably the current ratings shall be 2700 amp, 2500 Amp, 2000Amp, 1600 Amp and 1000 Amp.			2	Temperature Rise allowed above ambient	40° C for plain joints 55° C for Silver plated joints.			c)	SWGR. CUBICLE CONSTRUCTIONAL REQUIREMENTS				1	Color finish	RAL9002 (Main body)				Exterior	RAL 5012 (Extreme end covers)			2	Cable entry					a)	Power Cables	Bottom			b)	Control Cables	Bottom		3	Bus duct entry	Top			4	Earthing conductor	Galvanized steel strip		
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						<table><tr><td>5</td><td>Service Continuity of swgrs(as per IS/IEC 62271-200)</td><td>LSC2B-PM</td></tr><tr><td colspan="3">d) CIRCUIT BREAKERS</td></tr><tr><td>1</td><td colspan="2">The circuit breakers current rating shall be selected from the load current given in SLD which is at an ambient of 50° C.</td></tr><tr><td>2</td><td>Short circuit breaker Current</td><td>11 kV 6.6 kV 3.3 kV</td></tr><tr><td></td><td>a) A.C. component</td><td>40kA 40 kA 40K A</td></tr><tr><td></td><td>b) D.C. component</td><td>As per IS: 13118 or IEC-62271</td></tr><tr><td>3</td><td>Short Circuit making current</td><td>100 kA (peak) 100 kA (peak) 100 kA (peak)</td></tr><tr><td>4</td><td>Operating Duty</td><td>B-3 Min-MB-3 Min-MB</td></tr><tr><td>5</td><td>Total break time</td><td>Not more than 4 cycles</td></tr><tr><td>6</td><td>Total make time</td><td>Not more than 5 cycles</td></tr><tr><td>7</td><td>Operating Mechanism</td><td>Motor wound spring charged stored energy type as per IEC-62271</td></tr><tr><td>e)</td><td colspan="2">CURRENT TRANSFORMER</td></tr></table>	5	Service Continuity of swgrs(as per IS/IEC 62271-200)	LSC2B-PM	d) CIRCUIT BREAKERS			1	The circuit breakers current rating shall be selected from the load current given in SLD which is at an ambient of 50° C.		2	Short circuit breaker Current	11 kV 6.6 kV 3.3 kV		a) A.C. component	40kA 40 kA 40K A		b) D.C. component	As per IS: 13118 or IEC-62271	3	Short Circuit making current	100 kA (peak) 100 kA (peak) 100 kA (peak)	4	Operating Duty	B-3 Min-MB-3 Min-MB	5	Total break time	Not more than 4 cycles	6	Total make time	Not more than 5 cycles	7	Operating Mechanism	Motor wound spring charged stored energy type as per IEC-62271	e)	CURRENT TRANSFORMER	
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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS																								
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i)	CONTACTORS :																																																		
1.	Nominal System Voltage	6.6 kV		3.3 KV																																															
2.	Highest System Voltage	7.2 kV		3.6 KV																																															
3.	Rated Frequency	50 HZ		50 Hz																																															
4.	Rated Continuous Current at 50°C ambient	Current rating shall be selected appropriate for the load current.																																																	
5.	Control Supply Voltage	240V DC unearthed																																																	
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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS			
						<table><tr><td>6.</td><td>Utilisation category</td><td>AC-3</td></tr></table>	6.	Utilisation category	AC-3
6.	Utilisation category	AC-3							
95.	SECTION – VI, PAR T-B	SUB-SECTION-II-E9 HT SWITCHG EAR	3.00.00	6 of 39	h) SURGE ARRESTERS (FOR MOTOR FEEDERS) 3. Rated Voltage of Surge arrester 12 KV for 11 KV And 4.5 KV for 3.3 KV	h) SURGE ARRESTERS (FOR MOTOR FEEDERS) 3. Rated Voltage of Surge arrester 12 KV(Phase to Phase) for 11 KV And 4.5 KV (Phase to Phase) for 3.3 KV			

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
96.	SECTION - VI, PAR T-B	SUB-SECTION-II-E9 HT SWITCHG EAR	4.5.1	11 of 39	The circuit breaker / contactor will normally be controlled from remote control panels (DDCMIS) as well as from Switchgear SCADA System (via Numerical Relays) through closing and shunt trip coils.	The circuit breaker / contactor will normally be controlled from remote control panels (PLC/DCS) (via Numerical Relays) through closing and shunt trip coils.
97.	SECTION - VI, PAR T-B	SUB-SECTION-II-E9 HT SWITCHG EAR	4.5.1	15 of 39	(a) All switchboards shall be provided with separate LV panels at both the extreme ends which shall house the control & space heater supply distribution system, Ethernet switches (provided by employer) and other LV equipment common for the board. (e) Power Supply to Numerical Relay and Ethernet switch shall be an independent circuit with switch and fuse tapped from the panel DC supply.....	(a) Bus PT Panel shall house the control & space heater supply distribution system and other LV equipment common for the board. e) Power Supply to Numerical Relay shall be an independent circuit with switch and fuse tapped from the panel DC supply.....
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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
98.	SECTION – VI, PART T-B	SUB-SECTION-II-E9 HT SWITCHG EAR	5.1.4	19 of 39	(d) Board IED (Switchgear Control Unit)-32BI + 32 BO	DELETED

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
99.	SECTION - VI, PART B	SUB-SECTION-II-E9 HT SWITCHGEAR	5.1.7	19 of 39	All the numerical relays shall have communications on three ports, local front port communication to laptop and dual ports on IEC 61850 to communicate with the employer's data concentrator through LAN. The dual IEC 61850 ports shall be connected to two separate Ethernet switches (provided by employer) to form part of the Switchgear SCADA.	All the numerical relays shall have communications on two ports, local front port for communication to laptop and one RJ45 port on IEC 61850.
100.	SECTION - VI, PART B	SUB-SECTION-II-E9 HT SWITCHGEAR	5.3.1	22 of 39	Control of breakers / vacuum contactors shall be carried out from the HMI station of Switchgear SCADA system through the LAN and the numerical relays as well as from DDCMIS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.	Control of breakers / vacuum contactors shall be carried out from PLC/DCS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.

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					provided.	
101.	SECTION – VI, PART-B	SUB-SECTION-II-E9 HT SWITCHGEAR	5.3.8	23 of 39	The alarm / status of each individual protection function and trip operation shall be communicated to the Switchgear SCADA system.	DELETED

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
102.	SECTION - VI, PAR T-B	SUB-SECTION-II-E9 HT SWITCHG EAR	5.4.00 5.4.1	23 of 39	NETWORKING Adequate space in the LV panel shall be identified for mounting of at least 2 Nos of employer's Ethernet Switches (19" rack mounting) in all switchgears. Further, mounting of Ethernet switch in the above compartment and inter-panel wiring of Ethernet cable for connection of all numerical relays on the switchgear to the Ethernet switches shall be in the contractor's scope. Arrangement to provide required control supply to Ethernet switch shall be made in the switchgear.	DELETED

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
103.	SECTION - VI, PART B	SUB-SECTION-II-E9 HT SWITCHGEAR	6.1.00	25 of 39	 For all important components like Surge Arrestors and Numerical relays, Ethernet switches, Data concentrators & Fibre Optic cables, the contractor shall submit the reports of all the type tests as per applicable standards and carried out not earlier than ten years prior to the date of bid opening.	... For all important components like Surge Arrestors and Numerical relays, the contractor shall submit the reports of all the type tests as per applicable standards and carried out not earlier than ten years prior to the date of bid opening.
104.	SECTION - VI, PART B	SUB-SECTION-II-E9 HT SWITCHGEAR	7.0.00	27 of 39	Training workshop at site for Switchgear Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of MV Switchgears. The scope shall include Two No's of MV Switchgear workshops and Training for a batch of 20 Engineers and a separate batch of 20 supervisors/technicians for two(2) days in each workshop	Training workshop at site for Switchgear Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of MV Switchgears. The scope shall include one number of MV Switchgear workshop and Training for a batch of 20 Engineers and a separate batch of 20 supervisors/technicians for two (2) days at Project site. One day

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					at Project site. One day shall be for class-room training & One day shall be for hands-on training on MV Switchgears. One such Workshop shall be organized before the commissioning of First MV Switchboard and the Second workshop shall be conducted before Unit Commissioning. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.	shall be for class-room training & One day shall be for hands-on training on MV Switchgears. The workshop shall be organized before the commissioning of First MV Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.
105.	SECTION - VI, PART-B	SUB-SECTION-II-E9 HT SWITCHG EAR	8.0.00	28 of 39	Training workshop at site for Numerical Relay Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of Numerical Relays and trouble shooting. The scope shall include Two No's of Numerical Relay workshops and Training for a batch of 20 Engineers at Project Site for 2 days in each of workshop at project site.	Training workshop at site for Numerical Relay Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of Numerical Relays and trouble shooting. The scope shall include one number of Numerical Relay workshops and Training for a batch of 20 Engineers at Project Site for 2 days at project site. One day shall be for class-room
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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
106.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	1.01.01	1 of 58	One day shall be for class-room training & One day shall be for hands-on training on Numerical Relays. One such Workshop shall be organized before the commissioning of First MV Switchboard and the Second workshop shall be conducted before Unit Commissioning. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems	training & One day shall be for hands-on training on Numerical Relays. The workshop shall be organized before the commissioning of First MV Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.
					Lighting load of 50 kVA (Minimum) shall be considered on each section of main switchgears with incomer from transformer as indicated in the tender SLD.	Lighting load of 50 kVA (Minimum) shall be considered on each section of main switchgears with incomer from transformer.

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107.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	1.03.00	2 of 58	Spare capacity and Future Requirements All LV Switchboard shall be provided with spare feeders / modules as specified in relevant clause of Part-A of Technical Specification.	DELETED
108.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	1.04.00	2 of 58	It shall be preferred to have all LV Switchboards for the entire plant from a single manufacturer maintainability and spares management point of view.	DELETED
109.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	1.05.00	2 of 58	(f) Separate control cables shall be laid for EPB (Emergency/Local Push Button) status from EPB to Switchgear for the Switchgear and DCS.	(f) Separate control cables shall be laid for EPB (Emergency/Local Push Button) status from EPB to Switchgear for the Switchgear and PLC/DCS.

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110.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	4.25.00	12 of 58	Adequate space in a separate compartment shall be identified for mounting of Ethernet Switch (19" rack mounting), in all switchgears having numerical relays. Further, mounting of Ethernet switch in the above compartment at site and provision of inter-panel wiring (Cat5e Ethernet / Fibre Optic) for connection of numerical relays to Ethernet switch shall be in the contractor's scope. Arrangement to provide required control supply (110 V / 220 V DC) to Ethernet switch shall be made in the switchgear.	DELETED
111.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	11.00.00	18 of 58	TELESCOPIC TROLLEY The quantity of telescopic trolleys to be supplied shall be 2 Nos. per switchgear room.	TELESCOPIC TROLLEY The quantity of telescopic trolleys to be supplied shall be 1 No. per switchgear room.

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112.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	18.00.00	20 of 58	Numerical relays & networking	Numerical relays
113.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	18.01.00	20 of 58	 These relays shall be connected to the Switchgear SCADA System, through Ethernet switches.....	 DELETED
114.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	18.02.00	21 of 58	Control of circuit breakers shall be carried out from DDCMIS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.....	Control of circuit breakers shall be carried out from PLC/DCS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from PLC/DCS and no separate coupling relays shall be provided.

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115.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	18.03.00	21 of 58	Each numerical relay shall be connected to the Ethernet switch(in Employer's scope) provided in the Switchgear through Cat5e Ethernet /FO cable. Ethernet Switches shall be connected through Fibre Optic cable to form a ring network.	DELETED
116.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	18.04.00	21 of 58	The numerical relay shall be capable of measuring and storing values of a wide range of quantities, events, faults and disturbance recordings. The alarm / status of each of protection function and trip operation shall be communicated to Switchgear SCADA / DDCMIS. The numerical relays shall have built in feature / hardware interface to provide such inputs to Switchgear SCADA / DDCMIS for analog / digital values.	The numerical relay shall be capable of measuring and storing values of a wide range of quantities, events, faults and disturbance.

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117.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	18.05.00	21 of 58	The required .ICD / .CID files of the Numerical relays under the scope of this package for the integration with the SCADA shall be provided by the Numerical relay vendor along with necessary engineering support.	DELETED
118.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	18.11.00	22 of 58	All the numerical relays shall have communications on three ports, local front port for communication with laptop and dual ports on IEC 61850 to communicate with the Switchgear SCADA System.	All the numerical relays shall have communications on two ports, local front port for communication with laptop and one RJ45 port on IEC 61850.
119.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	18.26.00	23 of 58	Numerical relays shall have feature for Time synchronization through the Switchgear SCADA System. The resolution of time synchronization shall be +/- 1.0 millisecond or better throughout the entire system.	Numerical relays shall have feature for Time synchronization. The resolution of time synchronization shall be +/- 1.0 millisecond or better throughout the entire system.

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120.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	18.27.00	23 of 58	Relays & Ethernet switches shall be suitable to accept both AC & DC supplies with range 110V or 220V with tolerance of 70 % to 120 % of rated voltage & shall be finalized during detailed engineering.	Relays shall be suitable to accept both AC & DC supplies with range 110V or 220V with tolerance of 70 % to 120 % of rated voltage & shall be finalized during detailed engineering.
121.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	18.27.00	23 of 58	Bus no volt condition shall be configured to an output contact of the relay of incomers for suitably interfacing with DDCMIS wherever required.	Bus no volt condition shall be configured to an output contact of the relay of incomers for suitably interfacing with PLC/DCS wherever required.
122.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	19.08.00	24 of 58	The alarm/status of each individual protection function and trip operation shall be communicated to Switchgear SCADA / DDCMIS.	DELETED

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123.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	19.12.00	24 of 58	Required No. of extra binary inputs shall be provided in the numerical relay for digital inputs from critical outgoing MCCB feeders on that switchgear section	DELETED
124.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	19.13.00	24 of 58	Circuit-breaker status, protection status, etc. required for control logics shall be hardwired to DDCMIS.....	Circuit-breaker status, protection status, etc. required for control logics shall be hardwired to PLC/DCS.....

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125.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	19.14.01	24 of 58	The contractor shall arrange for training on design, engineering, Commissioning and operation & maintenance of LV Switchgear, Numerical relays and Switchgear networking system for a duration of one (1) man-months.	Training workshop at site for Switchgear Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of LT Switchgears. The scope shall include one number of LT Switchgear workshop and Training for a batch of 20 Engineers and a separate batch of 20 supervisors/technicians for two (2) days at Project site. One day shall be for class-room training & One day shall be for hands-on training on LT Switchgears. The workshop shall be organized before the commissioning of First LT Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.

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126.	SECTION - VI, PART-B	SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	19.14.02	24 of 58	The scope shall include training for a batch of engineers and a separate batch of Supervisors/Technicians at Project Site. One such Workshop shall be organized before the commissioning of First LV Switchboard and the second workshop shall be conducted before final system Commissioning. Owner shall provide the required Infrastructure such as Training Conference room, Projection systems etc.	Training workshop at site for Numerical Relay Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of Numerical Relays and trouble shooting. The scope shall include one number of Numerical Relay workshops and Training for a batch of 20 Engineers at Project Site for 2 days at project site. One day shall be for class-room training & One day shall be for hands-on training on Numerical Relays. The workshop shall be organized before the commissioning of First LT Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc

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127.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	31.00.00 31.01.00 31.02.00 31.03.00 31.04.00 31.05.00 31.06.00 31.07.00 31.08.00 31.09.00 31.10.00 31.11.00	31 & 32 of 58	BUS TRUNKING SYSTEM (SANDWICH BUSDUCT)	DELETED
128.	SECTION - VI, PAR T-B	SUB-SECTION-II-E10 LT SWITCHG EARS & LT BUSDUCT S	38.04.00	34 of 58	Type test reports for the following tests on the model of the Numerical relays, Ethernet switches shall be submitted for Employer's review.	Type test reports for the following tests on the model of the Numerical relays shall be submitted for Employer's review.
129.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT	5.03.00	3 OF 20	Owner shall provide two (2) number..... The alternator outgoing supply of DG set shall be fed	Bidder shall provide two (2) number..... The alternator outgoing supply of DG set shall be fed into bidder's

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		ORS			into employers breaker panel.	breaker panel.
130.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT ORS	6.01.00	4 of 20	All DG..... It shall also have auto initiation through command from remote from owner's panel.....included in the offer	All DG.... It shall also have auto initiation through command from remote from bidder's panel.....included in the offer
131.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT ORS	7.10.03	7 OF 20	(I) Earth fault (alarm) input from owners switchgear	(i) Earth fault (alarm) input from bidder's switchgear
132.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT ORS	7.11.00	8 of 20	Suitable 4-20mA transducers with dual output shall be provided in the control panel for voltmeter & frequency meter for owners use at remote	Suitable 4-20mA transducers with dual output shall be provided in the control panel for voltmeter & frequency meter for bidder's use at remote
133.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT ORS	7.12.00	8 of 20	The bidder is required to provide coupling relays (with diodes) having 24V DC energising coil in the control panel for the followings	The bidder is required to provide coupling relays (with diodes) having 24V DC energising coil in the control panel for the followings for bidder's use

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		ORS			owner's use	
134.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT ORS	7.14.00	8 of 20	Provision for following status/ signal for Employers information shall be provided in the DG control panel for both main & standby DG Sets:	Provision for following status/ signal for Bidder's information shall be provided in the DG control panel for both main & standby DG Sets:
135.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT ORS	3.00.00	2 of 20	Technical Requirements:- Fuel service tank:-8 hours running	Technical Requirements:- Fuel service tank:- 990 litres
136.	SECTION - VI, PAR T-B	SUB-SECTION-II-E11 DIESEL GENERAT ORS	7.04.00	5 of 20	A tinned copper/ aluminium bar of adequate dimension shall be provided for earth connection complete with nuts and bolts as required for external connection to Employers earth grid	A tinned copper/ aluminium bar of adequate dimension shall be provided for earth connection complete with nuts and bolts as required for external connection to Bidder's earth grid

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
137.	SECTION - VI, PART-B	SUB-SECTION-II-E15 STATION LIGHTING	4.00.00	5 of 19	5) While finalizing the detailed layout of lighting fixtures, the position/location and layout of equipments should be taken into account to have adequate illumination at desired locations	5) Different Lighting Systems envisaged for various plant areas are indicated in Annexure-E2: While finalizing the detailed layout of lighting fixtures, the position/location and layout of equipments should be taken into account to have adequate illumination at desired locations
138.	SECTION - VI, PART-B	SUB-SECTION-II-E15 STATION LIGHTING		18 of 19	NA	Annexure -E2 attached
139.	SECTION - VI, PART-A	SUB-SECTION-III-B ELECTRIC AL SYSTEM/EQUIPMENT	1.08.00	2 OF 6	2) Contractor scope shall include...in the FGD area as shown in Drg no :- 0011-999-POC-F-001... and suitability....	2) Contractor scope shall include...in the FGD area as shown in GLP drawing of respective plant....and suitability....

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
140.	SECTION - VI, PART-B	SUB-SECTION-II-E6 CABLING, EARTHING & LIGHTNING PROTECTION	9.00.00	23 OF 23	e) NA	e) The cable entry and exit from switchgear room shall be from 1.5 mtr (minimum) above FGL
141.	SECTION - VI, PART-B	SUB-SECTION-II-E12 Outdoor Transformer	7.00.00		NEW CLAUSE ADDITION	Specification for Dry type (indoor transformers) Attached as Annexure-E3

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SL. No.	Sect ion / Part	SUB SECTION	Clause No.	Page No.	EXISTING	READ AS
142.	Part-B, Section-VI	Sub-Section-I-M7	3.01.00	3-4 of 32	A. General System Description The wastewater stream.....in the tender. Brine Concentrator The design of brine concentrator.....produce solids. Crystallizer System Waste water.....Vapour compressor	A. General System Description The wastewater stream.....in the tender. Brine Concentrator The design of brine concentrator.....produce solids. Vacuum/Low temperature operation system Vacuum/Low temperature operation, where no seed slurry is added and wastewater boil in low temperature due to vacuum condition, is also acceptable provided such system meets the provenness criteria specified in tender. In case, the Bidder provides such a system, all other associated system etc. shall be provided in line with the reference project which meets the provenness criteria proposed by the vendor. Further, the contractor shall provide all necessary support documents like P&IDs, Process
LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-0011-109(1A)-2					AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)	Page 92 of 117

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						calculation, Equipment Layouts, etc. of the Reference Project during detail engineering & same equipment/system shall be provided for these projects also as a minimum. Further, Contractor shall also comply with all other requirements like Design criteria, Redundancy of equipment, MOC, Guarantee etc. as specified in this Technical specification. <u>Crystallizer System</u> Waste water.....Vapour compressor
143.	Part-A, Section-VI	Sub-Section-III-A6	1.02.00	1 of 3	Evaporative concentration system The softened wastewater..... vacuum pumps(if applicable), Seeding system, Chemical feeding system, ...provided as per system requirement.	Evaporative concentration system The softened wastewater..... vacuum pumps(if applicable), Seeding system, Vacuum/Low temperature operation system, Chemical feeding system, ...provided as per system requirement.
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144.	VII/A	III-A1	2 of 9	2.04.00	Clean gas from the absorber shall be taken to the Wet Chimney, to be provided by the Contractor, through three stage mist eliminators. The contractor shall terminate the flue gas duct (at a suitable point on the common flue gas duct to chimney-upstream of the chimney terminal point and outside the chimney). Provision shall be made for facilitating operation of unit with FGD bypass through existing stack. All modifications required including providing bypass damper & Gate is included in the scope of the Contractor.
145.	VII/A	III-A1	1 of 9	1.03.00	The FGD system Lot 1A Project. The contractor shall also supply an auxiliary absorbent tank, common for all the units, for storage of absorber slurry of one unit. The contractor's scope.....system.

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146.	V/A	III-A1	2 of 9	2.06.00	The gypsum from the absorber(s).....provided. Washed and dewatered gypsum from the dewatering system shall be fed to a belt conveyor (in Employers scope). The contractor shall discharge the gypsum cake above the Gypsum handling belt conveyor to be provided by the Contractor .
147.	V/A	III-A1	5 of 9	7.00.00	PROCESS WATER & COOLING WATER STORAGE & PUMPING SCHEME
148.	V/A	III-A1	6 of 9	7.01.01	2x100% Process Water Pumps for each unit connected to each of the Process water Storage tanks (for example total 4 nos. of pumps for 2x800 MW) along with all necessary piping, valves, control & instrumentation. Each pump catering to process water requirement of one unit.

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149.	V//A	III-A1	6 of 9	7.02.00	2x100% Mist Eliminator Wash Water Pump for each unit connected to each of the Process water Storage tanks (for example total 4 nos. of pumps for 2x800 MW) along with all necessary piping, valves, control & instrumentation. Each pump Technology Collaborator.
150.	V//A	III-A1	5 of 9	6.01.00	The Contractor shall provide a common auxiliary absorbent tank, common for all the units, of sufficient capacity for storage of absorber slurry of one unit.
151.	V//B	I-M1	7 of 51	3.03.09	The dampers shall be pneumatically operated and controlled from the controlroom. Provision shall be made for giving signal automatic bypass controls of the absorber in case of failure of the absorber spray system. The dampers therimofthehand wheel.

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152.	V//B	I-M1	20 of 51	5.06.23	It should be possible to discharge the absorber sump into the emergency drain tank within 2 hours.
153.	V//B	I-M1	29 of 51	7.08.01	The Contractor shall provide an auxiliary absorber tank, for the unit, sized to contain the complete slurry of one absorber tank at its maximum level equipped with all necessary pumps, valves, piping and controls to transfer the tank's contents back to the absorber to refill the absorber sump. It should be possible to discharge the each absorber into the Auxiliary Absorbent tank within 2 hours.
154.	V//B	I-M1	3 of 51	1.03.08	In case of a power failure all items of equipment (e.g. minimum one agitator in absorber and limestone slurry tank, Process water pump & lube oil system of Booster Fan & Ball Mill) which may cause irreversible damage to the FGD System shall be connected to the emergency power supply system to be provided by the Contractor. Bidder shall furnish a list of all such Auxiliaries in their bid proposal.

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	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.	
155.	V//B	I-M1	39 of 51	16.01.03	The flue gas duct upto Booster Fan inlet shall be designed for ± 660 mm w.g. at 67% of yield strength of material. The flue gas duct from Booster Fan outlet shall be designed for $+ 660$ mm $\&$ - 150 mm wg or maximum conceivable pressure of the Booster Fan, whichever is higher, at 67% of yield strength of material.
156.	V//B	I-M1	8 of 51	4.01.01 3 (iii)	Pressure at Terminal Point before Booster Fan suction 0 mmWc
157.	V//B	I-M1	16 of 51	5.04.00	Each absorber The pumps shall be designed to meet the stipulations of Clause No.8.00.00 of this Sub-Section.
158.	V//B	I-M1	20 of 51	5.06.22	In case of Spray Tower System, Suction screens shall be installed inside the Absorber vessel to protect the Slurry recirculation pumps. In case of Bubbling type, the Slurry recirculation pumps. In

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				suction strainers shall be installed at the suction side of Gas Cooling Pumps. For the agitators a flushing system for start ups shall be provided.	case Bubbling type, suction strainers shall be installed at the suction line side of Gas Cooling Pumps. The Screens shall be made of made of Alloy 59 /C276 or abrasion resistant FRP/Polypropylene (in case Contractor/Collaborator has proven experience). For the agitators a flushing system for start ups shall be provided.
159.	V//B	I-M1	20 of 51	5.06.21	The bottom for this. The bottom of the absorber sump shall be designed in such a way that complete drainage of the absorption liquid/slurry is possible and is accessible without damage of lining/rubber.
160.	V//B	I-M1	22 of 51	6.03.05	In addition, a hand wheel with proper access shall also be provided for manual operation of the gate. The force at the rim of the hand wheel shall not exceed 35 kg with bunker full of coal.
					In addition, a hand wheel with proper access shall also be provided for manual operation of the gate. The force at the rim of the hand wheel shall not exceed 35 kg with bunker full of limestone.

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	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.	Flow	Flow	110% of limestone requirement of all the absorbers at Design point
161.	V/B	I-M1	22 of 51	6.05.01 (ii)	Flow	Flow	110% of limestone requirement of all the absorbers at Design point
162.	V/B	I-M1	24 of 51	6.07.03	The limestone load operation. The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 10 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.	The limestone load operation. The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 6 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.	
163.	V/A	V	3 of 26	2.00.00	The Flue Gas Desulphurisation (FGD) System FOR MOUDA-II 2X660 MW, TANDA-II 2X660 MW, NABINAGAR-I 3X660 MW, MEJA-I 2X660 MW & BARH-I 3X660 MW shall be designed to comply with the requirements stipulated under 'Guarantee point and Design point' in the table below: and 273.15 K.	The Flue Gas Desulphurisation (FGD) System FOR MOUDA-II 2X660 MW, TANDA-II 2X660 MW, NABINAGAR-I 3X660 MW & BARH-I 3X660 MW shall be designed to comply with the requirements stipulated under 'Guarantee point and Design point' in the table below: and 273.15 K.	

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164.	V/A	V	1 of 26	1.00.00 7 (iii)	H ₂ O (% v/v wet)	10.910	3.958	H ₂ O (% v/v wet)	10.910	13.958
165.	V/A	V	4 of 9	4.01.04	2x100% Centrifugal/ positive displacement type oxidation blowers / compressors.			2x100% electric motor driven, single-stage, integrally geared, single or dual vane centrifugal type oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blowers will be used for supplying a variable volume of air to the absorber reaction tank		
166.	V/B	I-M1	8.05.00	30 of 51	The pump casing should be radially split to allow easy removal of impeller.			In case of pump with rubber lined casing, the casing should be radially split to allow easy removal of impeller.		

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167.	V//B	I-M1	30 of 51	8.07.00	For absorber recirculation service a Silicon carbide/ hi-chrome impeller and SiC lining for casing can also be accepted if the manufacturer has supplied a similar pump for a previous installation for similar service

SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
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168.	V//B	I-M1	11 of 51	4.04.00	ID fans: Fan casing material thickness Abrasion and wear resistant, high BHN steel having minimum 8.0mm thickness or 12mm mild steel with liner of thickness 10mm (min.) Alternatively, 22 mm thickness casing of mild steel is also acceptable.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS																		
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.																				
169.	VII/A	VII	6 of 61	1.02.00	<table><tr><th colspan="2">Gates in Flue Gas System</th></tr><tr><td>1. Seals</td><td>1 set of each type (Set means complete replacement for one gate)</td></tr><tr><td>2. Actuator</td><td>1 no. of each type & rating</td></tr><tr><td>3. Expansion joint</td><td>1 number for each type and size</td></tr><tr><td>4. Seals for guillotine gate (Both port side and bonnet side) (In case Gates are provided)</td><td>1 set for each gate</td></tr></table>	Gates in Flue Gas System		1. Seals	1 set of each type (Set means complete replacement for one gate)	2. Actuator	1 no. of each type & rating	3. Expansion joint	1 number for each type and size	4. Seals for guillotine gate (Both port side and bonnet side) (In case Gates are provided)	1 set for each gate	<table><tr><th colspan="2">Gates in Flue Gas System</th></tr><tr><td>1. Seals</td><td>1 set of each type & size (Set means complete replacement for one gate)</td></tr><tr><td>2. Actuator</td><td>1 no. of each type & rating</td></tr><tr><td>3. Expansion joint</td><td>1 number for each type and size</td></tr></table>	Gates in Flue Gas System		1. Seals	1 set of each type & size (Set means complete replacement for one gate)	2. Actuator	1 no. of each type & rating	3. Expansion joint	1 number for each type and size
Gates in Flue Gas System																								
1. Seals	1 set of each type (Set means complete replacement for one gate)																							
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3. Expansion joint	1 number for each type and size																							
170.	VII/A	VI	20 of 24	4.02.00 (vi)	<table><tr><th colspan="2">Waste Water</th></tr><tr><td colspan="2">The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I complete plant shall be 30 m³/hr</td></tr></table>	Waste Water		The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I complete plant shall be 30 m ³ /hr		<table><tr><th colspan="2">Waste Water</th></tr><tr><td colspan="2">The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I water treatment system for Barh-I (3X660 MW) shall be 30 m³/hr</td></tr></table>	Waste Water		The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I water treatment system for Barh-I (3X660 MW) shall be 30 m ³ /hr											
Waste Water																								
The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I complete plant shall be 30 m ³ /hr																								
Waste Water																								
The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I water treatment system for Barh-I (3X660 MW) shall be 30 m ³ /hr																								

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				averaged over a 24 hour period from each unit.	averaged over a 24 hour period and for Nabinagar (4x250 MW) shall be 20 m ³ /hr averaged over a 24 hour period from each unit
171.	V/B	I-M1	31 OF 51	10.01.00	All the slurry tanks (Slurry Tanks..... in accordance with the IS:803, latest edition. Additional Corrosion allowance of 3mm on the minimum tank shell Coarse-screen(s) at suction-side of these pumps shall be provided.
172.	V/B	I-M1	29 OF 51	7.08.02	The contractor shall provide 1x100% pump to pump back the slurry from the sump back to the absorber in a maximum time of 8 hours.

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173.	V/A	III-A1	4 of 9	6.01.00	The employer shall provide a common auxiliary absorbent tank, common for all the units, of sufficient capacity for storage of absorber slurry of one unit.	The Contractor shall provide a common auxiliary absorbent tank, common for all the units, of sufficient capacity for storage of absorber slurry of one unit.
174.	V/A	III-A1	1 of 9	1.03.00	The FGD system shall for each Lot 1A Project. The contractor shall also supply an auxiliary absorbent tank, common for the two units, for storage of absorber slurry of one unit. The contractor's scope shall include the absorbers, common limestone grinding system and gypsum dewatering system.	The FGD system shall for each Lot 1A Project. The contractor shall also supply an auxiliary absorbent tank, common for all units in a project , for storage of absorber slurry of one unit. The contractor's scope shall include the absorbers, common limestone grinding system and gypsum dewatering system.
175.	VI/B	I-M1	22 of 51	6.05.01	There shall be 2X100% tube mills for grinding of limestone. Each mill 13 (min).	There shall be 2X100% wet ball mills for grinding of limestone. Each mill 13 (min).

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176.	V/B	I-M1	7 of 51	3.03.08	All the gates shall be designed for tight shut off. The Guillotine gate type dampers mentioned at condition without the use of seal air fans of the damper. The Guillotine gates shall also be provided with a 2X100% complete seal air system. The bypass damper shall minimum one type of damper of each type and size.
177.	V/A	V	8 of 26	5.01.00	A "wet Chimney" shall be without FGD system in operation. The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation. The wet stack shall be designed as per the guidelines of EPRI Revised Wet Stack Design Guide.<

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				18 at Design Point	(minimum) mild steel with Borosilicate Glass Block Lining of minimum 38 mm thickness, which should have been in successful operation for similar application in at least two (2) units, located at different locations, for a period not less than two (2) years as on the date of Techno-Commercial bid opening. In such a case, Contractor/Lining supplier shall provide a ten (10) year full replacement guarantee and fulltime onsite QA supervision, during erection & commissioning, by the supplier of the lining system. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet.<< 18 at Design Point
178.	V/I/B	I-M1	6 of 51	3.02.04	The duct to Absorber inlet thickness. The duct from Absorber outlet to bypass duct shall be made of Carbon steel of minimum 7mm thickness clad

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179.	VII/B	I-M1	19 of 51	5.06.11	with 2 mm (minimum) thickness Alloy C276 / Alloy 59 or better material. The complete absorber vessel (absorber oxidation tank, absorber tower & absorber outlet duct) shall be made of clad sheet of C276 / Alloy 59 (minimum 2 mm thickness) having minimum 7 mm thick carbon steel as base material.
180.	VII/A	III-A1	6 of 9	8.02.00	The contractor system. The Interior surface of the Sumps shall be lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 5 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness.

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181.	VII/A	VII	6 of 61	1.04.00	Absorber 1. Absorber Spray/Oxidation nozzles 10% of each type and size 2. Absorber Mist Eliminator Washing Nozzles 10% of each type and size 3. Absorber Mist Eliminator 5% of each type and size/configuration
182.	VI/B	I-M1	25 of 51	7.03.01	Each set of primary dewatering hydro-cyclone shall be sized to dewater the gypsum slurry produced by the unit operating at Design point with an additional 10% margin. The outlet water content in the gypsum Each set of primary dewatering hydro-cyclone shall be sized to dewater the gypsum slurry produced by all the unit operating at Design point with an additional 10% margin. The outlet water content in the

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				shall be as per the requirement of the vacuum belt filters.	gypsum shall be as per the requirement of the vacuum belt filters.
183.	SECTION -VI/ Part-A	III-A2	3 of 4	3.00.00(i)	Complete compressed air and piping network for service air and instrument air application in FGD and ZLD system (if provided). Separate piping network for Service Air and Instrument Air shall be provided.
184.	SECTION -VI/ Part-A	VII MANDATORY SPARES	12 of 61	1.19.00	The referred clause stands deleted.
185.	SECTION -VI/ Part-A	III-A3 Fire Fighting System	1 of 2	1.2	HVW Spray System: Automatic fire detection cum high velocity water spray system shall be provided for various transformers (having oil capacity 2000 liters or more) envisaged under this

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186.	SECTION -VI/ Part-A	III-A3 Fire Fighting System	1 of 2	1.00.00 (1.4)	package. Tapping for HVW spray system shall be provided from nearby existing hydrant header. The contractor shall supply the following quantity (minimum) of fire extinguishers and install the same at various locations of FGD system as per TAC requirement. 1. Pressurized water type (9lit. capacity as per IS 15683): 5 nos 2. Co2 type (4.5 kg Cap IS:15683): 5 nos 3. Dry chemical type (6 kg Cap IS:15683) : 5 nos
187.	SECTION -VI/ Part-B	I-M3 COMPRESSED AIR SYSTEM	1 OF 7	1.01.00	The compressed air system shall consist of Air compressors & their motor drives, Air Drying (ADPs) Plants, air receivers for each Air compressors, instrumentation and control, control panels, compressed air piping, Instrument Air Piping

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				network, service air piping network and Unit Instrument Air receivers (One for each unit)	network, service air piping network etc.
188.	SECTION -VI/ Part-B	I-M3 COMPRESSOR AIR SYSTEM	2 of 7	3.01.00	Air Compressors (screw type) shall be designed for continuous operation with high efficiency to satisfy the performance requirement as per approved data sheet submitted by the bidder during detailed engineering
189.	SECTION -VI/ Part-B	I-M3 COMPRESSOR AIR SYSTEM	2 of 7	3.04.00	The clause stands deleted.
190.	SECTION -VI/ Part-B	I-M4 Fire Detection & Protection System	1 of 18	3.01.00	HVW AND MVW SPRAY SYSTEM General It shall consist of water mains network, deluge valves, isolation valves, Y type strainers, spray nozzles/ projectors, spray nozzles
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		m		isolation valves, Y type strainers, spray nozzles/ projectors, spray nozzles piping network, detection system, instrumentation, local control panels, cables etc..	piping network, detection system, instrumentation, local control panels, cables etc.
191.	SECTION -VI/ Part-B	I-M2 Air Conditioning and Ventilation	1 of 26	3.01.00	Modular type UAF units of suitable capacity (1x100%) shall be provided for non-air conditioned area of FGD control room /FGD cum ZLD control room building considering design philosophy for evaporative type ventilation system mentioned in clause 7.03.00, sub section- V (salient design data and sizing), Part-A of technical specification section VI. All non-air conditioned area of FGD (cable gallery& MCC room shall be positively ventilated and exhaust shall be through gravity damper.
192.	VI/ A	VI	22 of 24	5.00.00(xxii)	Total power consumption at motor input terminal at rated duty of fan of UAF divided by total nos. of units in respective project. (*) Total power consumption at motor input terminal at rated duty of fan of UAF divided by total nos. of units in respective project. (*) ((*) Above guaranteed power consumption values shall be at 20 deg C for centrifugal fans of AHUs
LOT 1A PROJECTS FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-0011-109(1A)-2				AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)	Page 113 of 117

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				and at 30 deg C for centrifugal fans of air washer units and at an elevation of RL (+) - m for both AHUs and Air washer unit centrifugal fans.)	and at 30 deg C for centrifugal fans of UAF and at an elevation of RL (referring to GLP of respective projects) for both AHUs and UAF centrifugal fans.)
193.	VI/B	I-M4	Page 2 of 18	5.02.00 (iii)	Above and Below false ceiling areas of all air-conditioned rooms of FGD and ZLD (as provided) control room building, various control rooms of auxiliaries as defined in Sl. No. (i) above.
194.	VI/	I-M2	Page 2 of 26	3.02.00 (iii)	Battery rooms & Oil rooms and fumes/odor generates ; Combination of intake louvers & Exhaust air/ roof extractor fans. Motors shall be flame proof.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS																
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.																		
195.	VII/A	II-A10	30 of 30	List of Drawings	---	Pipe cable trestle layout: (a) To (c) 9558-360-POC-C-307-sh1,2,3. (d) 9558-102-PVM-W-0023 Pipe cable trestle foundation: (a) 9558-360-POC-C-312 (b) 9558-102-PVC-V-029A Refer Annexures- A(i) to A(vi)																
196.	VII/A	II-A11	29 of 29	List of Drawings	<table><tr><th colspan="3">Table-6</th></tr><tr><td>5.</td><td>Pipe Cable Trestle Layout</td><td>Not located near FGD area</td></tr><tr><td>6.</td><td>Pipe Cable Trestle Foundation</td><td>Not located near FGD area</td></tr></table>	Table-6			5.	Pipe Cable Trestle Layout	Not located near FGD area	6.	Pipe Cable Trestle Foundation	Not located near FGD area	<table><tr><td>5.</td><td>Pipe Cable Trestle Layout</td><td>0270-315-POC-C-589-SH3</td></tr><tr><td>6.</td><td>Pipe Cable Trestle Foundation</td><td>0270-315-POC-C-589-SH1</td></tr></table>	5.	Pipe Cable Trestle Layout	0270-315-POC-C-589-SH3	6.	Pipe Cable Trestle Foundation	0270-315-POC-C-589-SH1	Refer Annexures- B(i) to B(ii)
Table-6																						
5.	Pipe Cable Trestle Layout	Not located near FGD area																				
6.	Pipe Cable Trestle Foundation	Not located near FGD area																				
5.	Pipe Cable Trestle Layout	0270-315-POC-C-589-SH3																				
6.	Pipe Cable Trestle Foundation	0270-315-POC-C-589-SH1																				

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
197.					General Layout Plan 1. Kudgi (3x800 MW) 9573-999-POC-F-001 Rev.6D1 2. Lara (2x800 MW) 9548-999-POM-F-001 Rev.6D0 3. Gadarwara (2x800 MW) 9572-999-POC-F-001 Rev.5D1 4. Darlipali (2x800 MW) 9549-999-POC-F-001 Rev.09 5. Mouda (2x660 MW) 9561/9575-999-POC-F-001 Rev.11-D0 6. Solapur (2x660 MW) 9571-999-POC-F-001 Rev.5D0 7. Tanda (2x660 MW) 9562-999-POC-F-002 Rev.8D1 8. Nabinagar JV (3x660 MW) 0370-999-POC-F-001 Rev.9	General Layout Plan 1. Kudgi (3x800 MW) 9573-999-POC-F-001 Rev.7 2. Lara (2x800 MW) 9548-999-POM-F-001 Rev.8 3. Gadarwara (2x800 MW) 9572-999-POC-F-001 Rev.6 4. Darlipali (2x800 MW) 9549-999-POC-F-001 Rev.10 5. Mouda (2x660 MW) 9561/9575-999-POC-F-001 Rev.11 6. Solapur (2x660 MW) 9571-999-POC-F-001 Rev.5 7. Tanda (2x660 MW) 9562-999-POC-F-002 Rev.9 8. Nabinagar JV (3x660 MW) 0370-999-POC-F-001 Rev.10 9. Meja (2x660 MW)

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	SEC/ PART	SUB SEC.	PAGE NO.		
				9. Meja (2x660 MW) 0360/0361-999-POC-F-001 Rev.6D0 10. Barh (3x660 MW) 9558/9560-999-POC-F-001 Rev.8D0 11. Nabinagar (4x250MW) 0270-999-POC-F-001 Rev. 6	0360/0361-999-POC-F-001 Rev.7. 10. Barh (3x660 MW) 9558/9560-999-POC-F-001 Rev.8 11. Nabinagar (4x250MW) 0270-999-POC-F-001 Rev. 8

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SECTI ON PART	SUB SECTI ON-III-C2 MEASU RING INSTR UMENT S	PAGE NO.	CLAU SE NO.		
1.	SECTI ON – VI, PART-B	SUB-SECTI ON-III-C2 MEASU RING INSTR UMENT S	19 to 30 of 34	10.00.00, 10.01.00, 10.02.00, 10.03.00, 10.04.00, 11.00.00, 11.01.00, 11.02.00, 11.03.00, 11.04.00, 11.05.00, 11.06.00, 11.07.00, 11.08.00	Clauses 10.00.00 to 10.04.00 and clauses 11.00.00 to 11.08.00	Clauses 10.00.00 to 10.04.00 and clauses 11.00.00 to 11.08.00 replaced as per attached C&I Annexure-I
2.	SECTI ON – VI, PART-A	SUB-SECTI ON-VII, Mandat ory Spares	44 of 61	Main clause 1.25.00	Clause no. 1.01.01, 1.01.02, 1.01.03, 1.01.04, 1.02.00, 1.03.00A, 2.07.00	Clause no. 1.01.01, 1.01.02, 1.01.03, 1.01.04, 1.02.00, 1.03.00A, 2.07.00 (Main clause 1.25.00 CONTROL AND INSTRUMENTATION) replaced as per attached C&I Annexure-II .
3.	SECTI ON – VI, PART-A	SUB-SECTI ON-VII, Mandat ory Spares	44 of 61	Main clause 1.25.00	---	New Clause no. 1.01.05 added in mandatory spare main clause 1.25.00 as per attached C&I Annexure-II .

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
4.	SECTION - VI, PART-A	SUB-SECTION-VII, Mandatory Spares	55 of 61	Main clause 1.26.00 ELECTRICAL	Mandatory spare Clause no. 1.02.00 ELECTRICAL ACTUATOR	Mandatory spare Clause no. 1.02.00 ELECTRICAL ACTUATOR (Main clause 1.26.00 ELECTRICAL) replaced as per attached C&I Annexure-II.
5.	SECTION - VI, PART-B	SUB-SECTION-II-E8 ELECTRICAL ACTUATOR WITH INTEGRAL STARTERS	1 to 5 of 5		SUB SECTION-II-E8 ELECTRIC ACTUATOR WITH INTEGRAL STARTERS	CHAPTER DELETED
6.	SECTION - VI,	SUB-SECTION-III-C-8	1 to 4 of 4		SUB-SECTION-III-C-8 ELECTRIC ACTUATORS	NEW CHAPTER ADDED as per attached C&I Annexure-III.
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS BIDDING DOCUMENT NO.: CS-0011-109(1A)-2						AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T) Page 2 of 60

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
	PART-B	ELECTRIC ACTUATORS				
7.	SECTION - VI, PART-B	SUB-SECTION-III-C2 MEASURING INSTRUMENTS	2 of 34	2.01.00	2.01.00 SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS	Clauses 2.01.00 SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS updated as per attached C&I Annexure-IV.
8.	SECTION - VI, PART-B	SUB-SECTION-III-C2 MEASURING INSTRUMENTS	10 of 34	3.05.00	3.05.00 TEMPERATURE TRANSMITTER (TT)	3.05.00 TEMPERATURE TRANSMITTER (TT) updated as per attached C&I Annexure-IV.
9.	SECTION - VI, PART-B	SUB-SECTION-III-C2 MEASURING INSTRUMENTS	34 of 34	New clause 15.00.00	--	New clause 15.00.00 Vibration Monitoring System (VMS) added as per attached C&I Annexure-IV.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
		INSTRUMENTS				
10.	SECTION - VI, PART-B	SUB-SECTION-III-C2 MEASURING INSTRUMENTS	34 of 34	New clause 16.00.00	--	NEW clause 16.00.00 FIELD INSTRUMENTS BASED ON FIELD BUS added as per attached C&I Annexure-IV .
11.	SECTION - VI, PART-B	SUB-SECTION-III-C9 CONTROL DESK & PANELS	1 to 3 of 3		----	SUB-SECTION-III-C9 CONTROL DESK & PANELS NEW CHAPTER ADDED as per attached C&I Annexure-V .

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12.	SECTION VI, PART-B	SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM			SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	CHAPTER replaced with SUB-SECTION-III-C5, DDCMIS as per attached C&I Annexure-VI.
13.	SECTION VI, PART-B	SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM			---	SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM

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14.	SECTION VI, PART-A	SUB-SECTION-III-B	2 of 6	1.05.00	Electric actuators with integral starters along with associated accessories etc shall be supplied on as required basis for Valves / Dampers to meet the functional and the other specification requirements.	DELETED.
15.	SECTION VI, PART-A	SUB-SECTION-III-C C&I	1 to 9		Sub Section IIIC/Part-A.	Replacing existing IIIC/Part-A with attached C&I Annexure-VIII.
16.	SECTION VI, PART-E	Tender drawing C&I	13 of 53 (of PDF)		Standard configuration drawing for PLC based offsite control system. Tender drawing no. 0000-151-POI-A-013.	Standard configuration drawing for control system. Tender drawing no. 0000-151-POI-A-013 updated and attached as per C&I Annexure-IX.
17.	SECTION VI, PART-B	SUB-SECTION-I-M6, LIMES TONE HANDLING	13 OF 73	4.9.6	Specification of vibration monitoring system	DELETED

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		PLANT (LHP)			
18.	SECTION VI, PART-A	SUB-SECTION-III-A1, FGD	7 OF 9	11.01.00	Gypsum Dewatering system & FGD common control room & containerised room (portable cabin) for analysers. The buildings must be complete.....
19.	SECTION VI, PART-B	SUB-SECTION-III-11 Containerised cabin (Portable room)			SUB-SECTION-III-11 CONTAINERISED ROOM (PORTABLE CABIN) SEPARATE CHAPTER ADDED as per attached C&I Annexure-X .

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19(a)	SECTION VI, PART-A	SUB-SECTION N-VII, Mandatory Spares	21 of 61	1.22.00 FIRE DETECTION AND PROTECTION SYSTEM	-	New Clause no. 7.5 and 7.6 added in mandatory spare main clause 1.22.00 as per attached C&I Annexure-II.
19(b)	SECTION VI, PART-A	SUB-SECTION ON-III-A2,	1 of 4 2 of 4	Clause 1.00.00 g) Clause 2.00.00 g)	Contractor shall provide control system is also acceptable. Contractor shall provide control system is also acceptable.	Control and monitoring of air conditioning and ventilation system shall be done from FGD control system. Control and monitoring of air conditioning and ventilation system shall be done from FGD control system.
19(c)	SECTION VI, PART-B	SUB-SECTION N-I-M2, AIR CONDITIONING AND VENTILATION	19 of 26	Clause 7.02.01	Contractor shall provide control system is also acceptable.	Control and monitoring of air conditioning and ventilation system shall be done from FGD control system.
20.	V/B	11-E4	4 OF 6	2.14.04	Cables shall be armoured type if laid in CHP area or directly buried	Cables shall be armoured type if laid in CHP area, directly buried and FGD Lime Stone and Gypsum Handling area
21.	V/B	11-E6	6 OF 69	3.05.01	Termination..... (Tender drg. No 0000-211-POE-A-51-RA of cable lug attached at the end of this chapter.)	Termination..... (Tender drg. No 0000-211-POE-A-51-RA of cable lug attached at the end of this chapter.) Tender drawing attached as Electrical Annexure E3- 0000-

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						211-POE--A-51-RA.									
22.	V/IB	II-E15	10 OF 16	4.01.00.19	In the Offsite area/buildings DC lighting shall be provided by self-contained 90 minutes duration Emergency lighting fixtures .Each shall be provided with Ni-Cd battery, battery charger & 2X10 W fluorescent lamps.	Deleted									
23.	V/IB	II E6	2 of 23	2.01.01	Interplant cabling..... All buried cables shall be armoured.	Interplant cabling Cables crossing Railway line (if applicable) shall be laid underground through nearest culvert. Necessary statutory clearance if required shall be taken by Bidder									
24.	V/IA	IIIB	5 of 6	1.15.00	---NA---	Size of ESP standby transformers to be fed from 11kV FGD switchgear are as follows: <table><tr><td>Kudgi, Solapur, Barh-I</td><td>Lara, Mauda-II, Meja New nabinagar.</td><td>1.6MVA</td></tr><tr><td>Darlipali, Nabinagar JV</td><td>Gadarwara, Tanda-II</td><td>2 MVA</td></tr><tr><td></td><td></td><td>1.6MVA</td></tr></table>	Kudgi, Solapur, Barh-I	Lara, Mauda-II, Meja New nabinagar.	1.6MVA	Darlipali, Nabinagar JV	Gadarwara, Tanda-II	2 MVA			1.6MVA
Kudgi, Solapur, Barh-I	Lara, Mauda-II, Meja New nabinagar.	1.6MVA													
Darlipali, Nabinagar JV	Gadarwara, Tanda-II	2 MVA													
		1.6MVA													
25.	V/IE		53		Electrical Single Line Diagram for FGD Package 0011-109-POE-J-001 rev B	Electrical Single Line Diagram for FGD Package 0011-109-POE-J-001 rev C Attached as Electrical Annexure E4- 0011-109-POE-J-001 rev C.									
26.	V/IB	II-E1	3 of 7	2.01.01	Adequate number of auxiliary transformers shall be provided to meet the demand on 11KV, 3.3KV and 415V systems under most onerous conditions, with the criteria that each 3.3KV / 415	Adequate number of auxiliary transformers shall be provided to meet the demand on 11KV, 3.3KV and 415V systems under most onerous conditions, with the criteria that									

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				V switchgear / MCC / DB shall be fed by 2x100% or 3 X 50 %, 3x100% transformers / feeders, and these shall be rated to carry the maximum load expected to be imposed.	each 3.3KV / 415 V switchgear / MCC / DB shall be fed by 2x100% or 3 X 50 %, transformers / feeders, and these shall be rated to carry the maximum load expected to be imposed. Wherever three incomer two bus coupler scheme is indicated, each incomer shall be sized to cater to load on its own bus section plus load on adjacent bus section.
27.	V/B	II-E12	1.01.00 (s)	4 of 31	TECHNICAL PARAMETERS (s) Termination Details (Indicative only) (3) LV Phase Terminal 3.45kV- Busduct
28.	V/B	II-E12	1.01.00 (n) 5 Method of neutral earthing and Vector group	2 of 31	ATTACHED TABLES— Electrical Annexure E1 REPLACE EXISTING TABLE.
29.	V/B	II-E12	1.01.00 (p)	3 of 31	ATTACHED TABLES— Electrical Annexure E1 REPLACE EXISTING TABLE.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
30.	VII/B	II-E12	1.01.00 (r)	4 of 31	REPLACE EXISTING TABLE.	ATTACHED TABLES— Electrical Annexure E1
31.	VII/B	II-E12	1.01.00 (t)	5 of 31	REPLACE EXISTING TABLE.	ATTACHED TABLES— Electrical Annexure E1
32.	VII/B	II-E18	---	---	-----	VARIABLE FREQUENCY DRIVE (VFD) chapter added as Electrical Annexure E2
33.	VII/A	III-B	1.15.00	5 of 6	-----	Variable Frequency Drive (VFD) The VFD system shall be provided for the equipment drive motors as envisaged in relevant portions of the specifications for equipment. The system shall be either Voltage Source Inverter (VSI) or Current Source Inverter (CSI) type. Complete VFD system along with associated equipment, HT/LT panel, HT/LT cable, Transformer etc. as applicable shall be provided. Bidder to provide Air-conditioned room to house Variable Frequency Drive (VFD).
34.	VII/B	II-E1	4 of 7	2.05.00 (c)		In case of any augmentation in owners HT switchgear (for ID booster fan motors), bidder shall make necessary provisions for switchgear control from owners DDCMIS/FGD DDDCMIS/FGD PLC (as decided during detailed engineering).
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34(a)	V//B	II-E2	2 of 9	3.01.00 b)	Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30	Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 % Tolerance on efficiency value applicable as per IEC 60034
34(b)	V//A	D-01	1 OF 282	5.03.09, PARA 7, LINE 3	The type of aviation obstruction lighting system shall be of medium intensity aviation obstruction lights having an effective intensity of 2000 to 20,000 cd depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 20000 cd. The intensity of lights shall be 20000 cd $\pm$ 25% at twilight and shall reduce automatically to a night time intensity of 2000 cd $\pm$ 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction lights and there will be four light units per level. The ground and vertical spacing of the	The type of aviation obstruction lighting system shall be of high intensity aviation obstruction lights having an effective intensity of 4000 to 200,000 cd (minimum) depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 200000 cd. The intensity of lights shall be 20000 cd $\pm$ 25% at twilight and shall reduce automatically to a night time intensity of 4000 cd $\pm$ 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction lights and there will be four light units per level. The
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					intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc.	lowest level should not be lower than 45 meters above the ground and vertical spacing of the intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc.
35.	Section VI / Part B	Sub-Section -IV-D Civil Works	2.00.00	1 of 69	"Sub QR for civil works."	" Clause Deleted"
36.	VI/B	Sub-section IVD Civil Works	1.02.00	01 of 69	The specifications are intended for the general description of the work.....in writing with the Employer in respect of interpretation of any portions of this document.	The specifications are intended for the general description of the work, quality and workmanship. The specifications are not, however, intended to cover minutest details and the work shall be executed according to the relevant latest Indian Standard Codes / I. R. S. / I. R. C. specifications. Where provisions are not covered in Indian Standards, reference shall be made to ACI, AISI, ASCE, EN, CICIND and other international standards or to the best prevailing local Public Works Department practices or to the instructions of the Engineer. Some of the relevant I. S. Codes to be followed

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					are mentioned in the Technical Specifications. The Contractor is expected to get clarified on any doubts about the specifications, etc. before bidding, in writing with the Employer in respect of interpretation of any portions of this document.
37.	VII/A	II- A1/A3/ A4/A5/ A6/A7/ A9/A11 Project Informa tion	5.00.00	SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” given in “Civil Annexure-1” to this amendment shall replace the “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” at Clause 5.00.00, Sub-section-II- A1/ A3/A4/A5/A6/A7/A9/A11, Part-A, Sec-VI, of Tech. Specification.
38.	Amendment No.03. to specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T)) SI.No. 13, Page-8 of 102			“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Lara STPP Project	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Lara STPP Project given in “Civil Annexure-2” to this amendment shall replace the “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” Amendment No.03. to Technical specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T)), SI.No. 13, Page-8 of 102
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39.	Amendment	No.03.	to	Technical specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T))	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Barh STPP Project	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Barh STPP Project given in “Civil Annexure-3” to this amendment shall replace the “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” at Amendment No.03. to Technical specification (Section-VI) (Amendment No. CS-0011-109(1A)-2-AMDT-03(T)), Sl.No. 14, Page-8 of 102
40.	Errata	No.01	to	Technical specifications, Section-VI (Doc. No.:CS-0011-109(1A)-2-ERRATA-01)	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Nabinagar STPP Project (3x660MW)	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” of Nabinagar STPP (3x660MW) Project given in “Civil Annexure-4” to this amendment shall replace the “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” at Errata No.01 to Technical specification (Doc. No.:CS-0011-109(1A)-2-ERRATA-01).

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					each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres.	Chimney shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point for single flue chimney shall be minimum 150 meters above the plant grade level and for twin flue chimney flue gas emission point shall be minimum 220m above the plant grade level. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres. For Barh-I (3X660MW) already existing 275m high chimneys shall be utilized with modifications as specified elsewhere in mechanical specification and hence, new chimney is not to be provided under FGD package. General Arrangement Drawing of already existing Chimneys at Barh-I are provided in Sub Section-II -A10, Part A, Section-VI for reference. The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be profiled into a circular shape to connect to the flue liner. The flue
47.	VI/B	IV-D	3.14.01 Para 3	11 of 69	The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be bottom supported and shall be profiled into a circular shape to connect to the	

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					flue liner. The flue duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic fluoroelastomeric fabric expansion joint.	duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic expansion joint.
48.	VI/B	IV-D	3,14.01 Para 4	11 of 69	The expansion joint in the flue liner shall comprise of non-metallic fluoroelastomeric material suitable to withstand a temperature of 300 Deg C , shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable to withstand a temperature of 300 Deg C and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh.	The expansion joint in the flue liner shall comprise of non-metallic material suitable for wet stack operations , shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable for wet stack operations and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh. Design of expansion joint shall comply EPRI guideline to avoid contact of condensate with expansion joint material and to ensure drainage of condensate.
49.	VI/B	IV-D	3,14.01 Para 5	11 of 69	Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from chimney shell	Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from

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					with chequered plate floor panels and pipe handrails, shall be provided for full height of the chimney and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch.	chimney shell with chequered plate floor panels and pipe handrails, shall be provided upto the platform just below roof platform and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch.
50.	VI/B	IV-D	3,14.01 Para 6	11 of 69	The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, mild steel wind stakes (if required) , all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation obstruction lighting with photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but reasonably implied and necessary to complete the job in all respects.	The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation obstruction lighting with photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but

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					reasonably implied and necessary to complete the job in all respects.
51.	V/B	IV-D	3.14.02 Para 7	12 of 69	The chimney and its components shall be designed to resist the most onerous forces resulting from all the possible combinations of the various loadings. Design of all chimney components shall be based on working stress method.
52.	V/B	IV-D	3.14.03 Para 1	12 of 69	The wind shield shall be designed for vertical loading, cross wind loading, seismic loading, circumferential wind loading, etc. The load calculation and load combinations shall be as detailed in IS 4998 (Part 1) : 1992. The wind shield shall be analysed for cases with and without flue liner loads.
53.	V/B	IV-D	3.14.03 Para 2	12 of 69	Forces/stresses in the wind shield due to eccentricity effects of local (e.g. corbel) loadings, insulations effects, rotation of chimney foundations, construction tolerances and moments of second order shall also be considered.
54.	V/B	IV-D	3.14.03 Para 6	12 of 69	DELETED

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					exceed 0.30fck where fck is the characteristic compressive strength of concrete.	
55.	V/B	IV-D	3.14.03 Para 9	13 of 69	There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a sudden change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level.	There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level.
56.	V/B	IV-D	3.14.03 Para 14	13 of 69	The final design shall be checked & verified by 'Wind Tunnel Test' and shall be conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located in the area or in the future expansion stage of the project shall be determined along with the other topographical features of the local area through model test.	The final design shall be checked & verified by 'Wind Tunnel Test' conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located upto distance of 20 times diameter at 2/3rd height of subject chimney , in the area or in the future expansion stage of the project, as envisaged by the owner at the time testing , shall be determined along with the other topographical features of the local area through model test.
57.	V/B	IV-D	3.14.04 Para 5	13 of 69	Clean-out door shall be provided below the flue for the removal of ash.	DELETED

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58.	V/I/B	IV-D	3.14.07 Para 5	14 of 69	The chimney foundation shall be designed for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any loading condition. Since chimney is a wind sensitive structure, no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. No allowance shall be made in the stresses for design of foundation for wind loading. The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum M 25 .	The chimney foundation shall be designed as per limit state method as per IS 4998 for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any portion of the foundation/piles for any loading condition. Since chimney is a wind sensitive structure, no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum M 30 .
59.	V/I/B	IV-D	3.14.08 Para 2	14 of 69	The insulation thickness shall be determined based on the maximum/minimum ambient	DELETED

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					temperature, surface air velocity worked out based on the draught of ventilation air in the annular space between the flue liner and chimney shell, insulation surface emissivity of 0.3 and the insulation cold face maximum temperature not exceeding 55 degree Celsius. The draught of air in the annular space shall be the natural draught created by the heating of air by the flue liner and the air being vented out through the openings in the chimney shell. The increase in the annulus air temperature due to the rising heated air shall be taken into account while calculating the insulation thickness.	
60.	VI/B	IV-D	3.14.09 (i)	15 of 69	All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) except surfaces of steel wind strakes shall be painted as specified in corrosion protection clause of this specification.	All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) shall be painted as specified in corrosion protection clause of this specification.
61.	VI/B	IV-D	3.14.09 (ii)	15 of 69	All exposed surfaces of steel wind strakes shall be painted with epoxy phenolic coating system having total 240 microns DFT. a) All steel surfaces shall be provided with two component epoxy primer coat (having solid by volume minimum 51% ±2%) of minimum 70 micron DFT to be applied over blast cleaned surface conforming to Sa 2½ finish of ISO 8501-1 with surface profile 40-60 Micron. The primer	DELETED

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62.	VI/B	IV-D	3.14.09 (iii)	15 of 69	coat shall be applied in shop immediately after blast cleaning by airless spray technique. b) Primer coat shall be followed with the application of Intermediate coat of epoxy phenolic coating (solid by volume minimum 63%) of minimum 100 micron DFT. This coat shall be applied in shop after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% $\pm$2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied in shop after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer. All steel parts embedded in concrete like Strake embedment assembly including bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes. All steel parts embedded in concrete like bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes.

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63.	VI/PA RT-A	II-A1 II-A2 II-A3 II-A4 II-A-5 II-A6 II-A7 II-A8 II-A9 II-A10 II-A11	-		General Layout Plan 1. Kudgi (3x800 MW) 9573-999-POC-F-001 Rev.7 2. Lara (2x800 MW) 9548-999-POM-F-001 Rev.8 3. Gadarwara (2x800 MW) 9572-999-POC-F-001 Rev.6 4. Darlipali (2x800 MW) 9549-999-POC-F-001 Rev.10 5. Mouda (2x660 MW) 9561/9575-999-POC-F-001 Rev.11 6. Solapur (2x660 MW) 9571-999-POC-F-001 Rev.5 7. Tanda (2x660 MW) 9562-999-POC-F-002 Rev.9 8. Nabinagar JV (3x660 MW) 0370-999-POC-F-001 Rev.10	General Layout Plan 1. Kudgi (3x800 MW) 9573-999-POC-F-001 Rev.8 (Civil Annex 6) 2. Lara (2x800 MW) 9548-999-POM-F-001 Rev.9 (Civil Annex 7) 3. Gadarwara (2x800 MW) 9572-999-POC-F-001 Rev.7 (Civil Annex 8) 4. Darlipali (2x800 MW) 9549-999-POC-F-001 Rev.11 (Civil Annex 9) 5. Mouda (2x660 MW) 9561/9575-999-POC-F-001 Rev.12 (Civil Annex 10) 6. Solapur (2x660 MW) 9571-999-POC-F-001 Rev.6 (Civil Annex 11) 7. Tanda (2x660 MW)				
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					9. Meja (2x660 MW) 0360/0361-999-POC-F-001 Rev.7 10. Barh (3x660 MW) 9558/9560-999-POC-F-001 Rev.8 11. Nabinagar (4x250MW) 0270-999-POC-F-001 Rev. 8	9562-999-POC-F-002 Rev.10 (Civil Annex 12) 8. Nabinagar JV (3x660 MW) 0370-999-PO-F-001 Rev.11 (Civil Annex 13) 9. Meja (2x660 MW) 0360/0361-999-POC-F-001 Rev.8 (Civil Annex 14) 10. Barh (3x660 MW) 9558/9560-999-POC-F-001 Rev.9 (Civil Annex 15) 11. Nabinagar (4x250MW) 0270-999-POC-F-001 Rev. 9 (Civil Annex 16)
64.	VII/A	II-A10	List of Drawings	30 of 30	-	Include the following new drawings enclosed herewith this Amendment at Sl. No. 6 & 7 respectively. 6. General Arrangement of Twin flue Chimney for Units1&2 (2x660 MW) – Drg. No. 9558-317-POC-A-001(Civil Annex 17)

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65.						7. General Arrangement of Single flue Chimney for Unit3 (1x660 MW) – Drg. No. 9558-317-POC-A-002(Civil Annex 18) Bidder shall utilize the area identified for FGD purpose. The area identified for FGD purpose in GLP shall be levelled and free from obstructions like sheds, trees etc. However, site clearance like removal of bushes, vegetation etc. is in Bidder's scope.
66.				New Clause		Dismantling & Removal of asbestos sheet shall be done by owner. However, site clearance like removal of bushes, vegetation etc. is in Bidder's scope.
67.	SECTION-VI/ Part-A	V SALIENT DESIGN DATA	7.03.00	13 of 26	DESIGN PHILOSOPHY – Ventilation System Note : Dry bulb temperature during summer season mentioned in clause 7.01.00 (Appendix-A) Sub- section V, Part-A shall be considered as Design Ambient Temperature for above.	DESIGN PHILOSOPHY – Ventilation System Note : Dry bulb temperature during summer season mentioned in clause 7.01.00 (Appendix-A) Sub- section V, Part-A shall be considered as Design Ambient Temperature for above.

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68.	SECTI ON-VI/ Part-A	V SALIEN T DESIG N DATA	7.01.00	12 of 26	For areas, where A/C load is of the order of 25-60 TR, Direct Expansion (DX) type Condensing unit (with AHU) shall be provided depending on the availability of space/ layout etc. For areas, where A/C load is of the order of 15-25TR, ductable split/package A/C shall be provided. Smaller areas which are away from the D-X type Condensing unit /central chilling units which may require air conditioning upto 15 TR rating shall be served with Hi-wall Split/Cassette air conditioner units as per requirement.	For areas like FGD control room where load is more than 15TR ,Direct expansion (D-X) type condensing unit (with AHU) shall be provided. For other areas where air conditioning requirement is 5-15 ductable split/package A/C shall be provided. If the air conditioning load is less than 5TR, then Hi-wall Split/Cassette air conditioner shall be provided.
69.	SECTI ON-VI/ Part-A	III-A2	3.00.00(i)	3 of 4	Complete compressed air and piping network for service air and instrument air application in FGD and ZLD system (if provided).	Complete compressed air and piping network for service air and instrument air application in FGD and ZLD system (if provided) shall be as per Tender drawing of compressed air system. (Mech Annexure I)
70.	VI/B	I-M4	5.02.00(b)	Page 2 of 18	Linear heat sensing cable detection system Gypsum and lime conveyor of FGD system and Cable Galleries covered under MVW Spray System.	Linear heat sensing cable detection system Gypsum and lime conveyor of FGD system and Cable Galleries.
71.	VI/B	I-M4	5.02.00(c)	Page 2 of 18	Quartzoid bulb heat detection system Equipments protected by HVW spray system, conveyors protected by MVW spray system.	Quartzoid bulb heat detection system Equipments protected by HVW spray system.

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72.	SECTION-VI/ Part-E	Tender Drawin g List	1.00.00 (A)	1 of 2	--	Schematic drawing of compressed air system
73.	VI/B	I-M4 Fire Detection & Protection System	5.15.00Notes: (3)	Page 13 of 18	Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas. Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor shall provide all the cables so as to complete the system.	Over and above, contractor shall provide all the cables so as to complete the system.
74.	VI/A	III-A2	2.00.00 (C)	2 of 4	Miscellaneous areas: All other areas like Limestone Grinding system building, Gypsum dewatering building, Recirculation pump & Oxidation Blower/compressor building etc & all other non-air conditioned areas covered under this package shall be ventilated by a combination of supply/exhaust fans and fresh air in-take / back draft louvers. For ventilation of Battery rooms and Oil rooms, fans with flame proof motor shall be used. Further, toilets shall be provided with propeller type exhaust air fans.	Miscellaneous areas: All other areas like Limestone Grinding system building, Gypsum dewatering building etc & all other non-air conditioned areas covered under this package shall be ventilated by a combination of supply/exhaust fans and fresh air in-take / back draft louvers. For ventilation of Battery rooms and Oil rooms, fans with flame proof motor shall be used. Further, toilets shall be provided with propeller type exhaust air fans. Note: The above list of Buildings is indicative only. Any Building under this

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						package which are of enclosed type, shall be provided by Mechanical ventilation.
75.	VI/B	I-M4	5.05.00	5 of 18	The detection zone/loop divisions of LHSC system shall match with MVW spray zones. Conveyors where LHSC shall be installed shall be divided into no. of various zones whereas conveyor for which IR detector is installed shall be considered as one zone.	The clause stands deleted
76.	VI/B	I-M4	5.16.00	13 of 18	Upon detection of fire either by QB detector or LHSC detector, the spray system shall be initiated. It shall also initiate spray system for the two adjacent zones after a time delay settable at site.	The clause stands deleted
77.	VI/B	I-M4	5.05.00	5 of 18	Mounting arrangement have been indicated in tender drawing.	Mounting arrangement will be provided as per proven practice.
78.	SECT I ON-VI/ Part-A	III-A2	3.00.00(g)	3 of 4	Monorail with Chain pulley block of minimum 2 tons or 125% of heaviest parts of equipment to be lifted whichever is more.	Monorail with electric hoist of minimum 2 tons or 125% of heaviest parts of equipment to be lifted whichever is more.
79.	A	III-A6 Zero Liquid Discharge System			Chapter 'Zero Liquid Discharge System'	Chapter 'deleted'.

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80.	A	VI	143 of 209	4.02.00 xvii)	Waste Water Treatment System (Applicable for Barh-I..... filter test.	Deleted.
81.	A	VII	16-18 of 61	1.20.00	SPARES FOR FGD Waste Water Treatment (FGD WWT) SYSTEM FOR ZLD(APPLICABLE FOR PROJECTS WHERE ZLD SYSTEM IS BEING PROVIDED)	Deleted.
82.	B	I-M7 Zero Liquid Discharge System			Chapter 'Zero Liquid Discharge System'	Chapter 'deleted'.
83.	E				Process Flow diagram for FGD waste water treatment(FGDWWT) system for ZLD Drawing No. 0011-109-POM-A-005 (Sht. 1 of 3, Sht.2 of 3 & Sht. 3 of 3)	Deleted.
84.	A	I Intent of Specification	15 of 19	4.04.00,	FGD WASTE WATER REATMENT SYSTEM FOR ZERO LIQUID DISCHARGE (ZLD)..... for each project.	Deleted
85.	A	I Intent of Specification	16 of 19	4.05.00	Provenness criteria for critical equipment, auxiliaries, systems and bought out items for FGD waste...../Anthracite coal/lignite.	Deleted

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86.	A	I Intent of Specific ation	3 of 19	1.03.05	ZERO LIQUID DISCHARGE (ZLD) SYSTEM for FGD waste water for Barh-I.....	Deleted.
87.	A	I Intent of Specific ation	5 of 19	3.00.00 A(5)	Process Flow Diagram for FGD Waste water treatment (FGD WWT).....	Deleted.
88.	Attach mewnt -12 to Section n VII	Part-F, Chapter -II, Sub Section :DM1	5 of 42	1.02.00 (xxviii)	Write up on ZLD...	Deleted
89.	Attach mewnt -12 to Section n VII	Part-F, Chapter -II, Sub Section :DM2			Zero Liquid	Sub Section:DM2 'deleted'
90.	VI/A	III-A4	1	1.01.00(i)	Piping for normal -----, piping for emergency -----pump, other piping, fittings, specialties -----and electrical equipment as required and as specified for the system.	Piping for normal -----, piping for emergency -----pump, other piping, fittings, supports, valves and specialties.....and structural steel shed for housing various equipment of Equipment cooling water system alongwith necessary handling arrangement as per CI No-14.09.00, Sub-section-M1, Part-B, Section-VI and

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91.	V/A	IV	2 of 3	1.04.01	Contractor shall take-----DM normal Make-up----- available along C-row at CD bay rack----- meeting the makeup water requirement of ECW system. The pressure available at TP will be 4Ksc wrt FGL (approx.).	Contractor shall take-----DM normal Make-up----- available along C-row at CD bay rack----- meeting the makeup water requirement of ECW system. The quantity (maximum) and pressure available at TP will be 2 m3/hr (Maximum) and 4Ksc wrt FGL (approx.) respectively.
92.	V/A	IV	2 of 3	1.04.02	Contractor shall take-----DM emergency Make-up header ----- available along C-row at CD bay rack----- meeting the emergency makeup water requirement of ECW system. The pressure available at TP will be 4Ksc wrt FGL (approx.).	Contractor shall take-----DM emergency Make-up header ----- available along C-row at CD bay rack----- --- meeting the emergency makeup water requirement of ECW system. The quantity (Maximum) and pressure available at TP will be 2m3/hr and 4Ksc wrt FGL (approx.) respectively.
93.	V/A	IV	2 of 3	1.06.00	For Gypsum washing, contractor shall take a tap off-----rack for meeting the water requirement -----washing. The pressure available at TP will be 4 Ksc (gauge) wrt FGL (approx.).	For Gypsum washing, contractor shall take a tap off -----rack for meeting the water requirement -----washing. The water quantity and pressure available at TP will be 0.015m3/hr/MW (Maximum) & 4 Ksc (gauge) wrt FGL (approx.) respectively.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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94.	V/A	VII	61 of 61	1.28.00	-----	New Cl. 1.28.00 Added for mandatory spares of ECW system. Refer Mechanical Annexure-II
95.	Section-VI, Part A	V	2.01.01	2 of 6	Limestone will be received to power plant through road by trucks and through Indian railway rakes. Lime stone received through Road shall be unloaded by Two (2) numbers Truck Tipplers each of minimum 40T capacity (Gross weight 60 T minimum) to discharge Limestone on to Box Feeder/ Surface Feeder/ Truck Unloading Hopper, complete with all mechanical, electrical and C&I, civil & structural works for unloading Limestone by truck tipplers. Two (2) numbers Box Feeders/Bulk-material Receiving Unit/<del>Underground</del>~~Truck Unloading Hopper~~ Surface feeder, for unloading of limestone from trucks/ self-tipping trucks/ loader shovels, complete with drives, accessories all mechanical, electrical and C&I, Civil & structural works, including its supporting foundations etc. This unit shall feed limestone onto the conveyor before Limestone crusher house.	Limestone will be received to power plant through road by truck. Lime stone received through Road shall be unloaded by Two (2) numbers Truck Tipplers each of minimum 40T capacity (Gross weight 60 T minimum) to discharge Limestone on to Box Feeder/ Surface Feeder/ Truck Unloading Hopper, complete with all mechanical, electrical and C&I, civil & structural works for unloading Limestone by truck tipplers. Two (2) numbers Box Feeders/Bulk-material Receiving Unit/Surface feeder, for unloading of limestone from trucks/self-tipping trucks/loader shovels, complete with drives, accessories all mechanical, electrical and C&I, Civil & structural works, including its supporting foundations etc. This unit shall feed limestone onto the conveyor before Limestone crusher house.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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					Limestone received through Indian Railway Rakes will be unloaded in one of the side discharge Wagon Tipplers or Track Hopper of existing Coal Handling Plant (CHP). Before existing Crusher house of CHP, the unloaded limestone will be fed to new limestone crusher house through series of new conveyors/bucket elevators. All necessary modifications involving Mechanical, Electrical, C&I, Civil and Structural works in the existing CHP for taking feed to new limestone path shall be in the scope of the bidder.	
96.	Section-VI, Part A	IV TERMINAL POINT S & EXCLUSIONS	1.09.00 (i)	2 of 3	For unloading of Limestone through WT/Track Hopper of the existing Coal Handling Plant, limestone 'Feed Point' before existing CHP's Crusher House	Clause DELETED.
97.	Section-VI, Part B	I-M6 LIMES TONE HANDLING PLANT	3.1.0	2 of 73	Unloading, Crushing and Bunker Feeding System Indian Railway rakes consisting of wagons consisting type of wagons as specified in RDSO G-33 (Rev-1) guidelines shall transport coal to the power plant. The coal received from wagons shall be unloaded in	Unloading, Crushing and Bunker Feeding System Two (2) numbers Box feeders/Bulk material receiving unit.....facilities. A mechanized system.....crusher.
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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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					underground RCC hopper by means of side discharge type wagon tippler. Side discharge type wagon tipplers are to be employed for unloading IR Coal rake. Side arm chargers are envisaged for placement of wagon on the tippler table & removal of empty wagon from tippler table after tipping. Clear access shall be provided for movement of pay loader/bulldozers on the hopper grating of wagon tippler. Grating over wagon tippler hopper shall be placed and designed accordingly. Apron feeder along with dribble conveyor are employed under each wagon tippler for extracting coal from wagon tippler hoppers. Indian Railway rakes consisting of Bottom discharge wagons shall also transport coal to the power plant. The coal received from wagons shall be unloaded in underground RCC Track hopper. Paddle feeders complete with all electrical, rails, supporting structures, end stops, cable reeling drums, trailing cables, and necessary arrangement for cabling on floor of track hoppers along with accessories, shall be installed at the bottom of the Track hoppers to scoop the coal from track hoppers and feed coal on to the underground conveyors.	
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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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					Limestone received through railway rakes will be unloaded in one of these three side discharge wagon tipplers or track hopper. Alternatively, Two (2) numbers Box feeders/Bulk material receiving unit.....facilities. A mechanized system.....crusher.	
98.	Sectio n-VI, Part A	V	10.15.00	25 of 26	Dust extraction system Type: Venturi scrubber type Location: Truck un-loading points, Junction Towers (limestone/ gypsum discharge & receipt points), limestone crusher house (including belt feeder & vibrating screening feeder) and lime stone/gypsum storage Shed/Silo.	Dust extraction system Type: Bag Filter type Location: Truck un-loading points, Junction Towers (limestone/ gypsum discharge & receipt points), limestone crusher house (including belt feeder & vibrating screening feeder) and lime stone/gypsum storage Shed/Silo.
		Sl. No. 73 Amdt no.3 to tech spec				
99.	Sectio n-VI, Part A	VI	4.02.00	15 of 19	Guarantees Under Category-II	Guarantees Under Category-II New Clause for Guarantee for LHS & GHS added as under: (xviii) Limestone Handling System and Gypsum Handling System.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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100.	Section-VI, Part A	III-A5.	2.01.11 & sl. No. 60 of Amdt no. 3 to Tech Spec.	3 of 6	One number of covered storage shed for crushed limestone. The storage shed shall be sufficient to store limestone equivalent to consumption of minimum 7 days at Design point (Generation of all units to be considered) or 5000 MT (wherever Railway Rake unloading is envisaged) whichever is higher. A reclaim hopper shall be provided below the limestone storage shed for the entire length of the stockpile. Alternatively, suitable number of Limestone Storage Silos to store limestone equivalent to consumption of minimum 7 days at Design point or 5000 MT (wherever Railway Rake unloading is envisaged) whichever is higher. Suitable number of Belt feeders below silos shall be provided taking feed from silo and discharging onto onward conveyors/ Bucket elevators.	The Bidder shall demonstrate the rated capacities of each conveying stream and the associated equipments for Limestone Handling system and Gypsum Handling System. One number of covered storage shed/silo for crushed limestone. The storage shed shall be sufficient to store limestone equivalent to consumption of minimum 7 days at Design point (Generation of all units to be considered). A reclaim hopper shall be provided below the limestone storage shed for the entire length of the stockpile. Alternatively, suitable number of Limestone Storage Silos to store limestone equivalent to consumption of minimum 7 days at Design point. Suitable number of Belt feeders along with suitable crushed limestone feed regulating mechanism below silos shall be provided taking feed from silo and discharging onto onward conveyors/ Bucket elevators. The Maximum capacity of each Limestone storage Silo shall not exceed 2000 MT.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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101.	Secio n-VI, Part A	III-A5	2.01.10	3 of 6	Suitable number of motorized travelling tripper / flow diverter plough (as applicable) on each feeding conveyor for feeding the crushed limestone to the covered storage shed . Trippers shall be complete with all mechanical, electrical equipment, rails, chute work, rail supporting structure (along with cable festooning required), cables with structural stools, as arrangement, thruster brakes, rail clamps, electric hoist, actuator flap gates etc.	Suitable number of motorized travelling tripper / flow diverter plough (as applicable) on each feeding conveyor for feeding the crushed limestone to the covered storage shed/Silo . Trippers shall be complete with all mechanical, electrical equipment, rails, chute work, rail supporting structure (along with cable festooning arrangement, thruster brakes, rail clamps, electric hoist, actuator flap gates etc.
102.	Secio n-VI, Part B	I-M6	3.5.0	3 of 73	SYSTEM DESCRIPTION: GYPSUM HANDLING PLANT Double conveyor stream shall be provided for conveying dewatered gypsum from vacuum belt filter to over ground storage under a shed near plant boundary . The storage shed shall be sized for 7 days of gypsum production with all the units in storage shed shall be loaded to user's trucks using front-end loader/ pay loader.	SYSTEM DESCRIPTION: GYPSUM HANDLING PLANT Double conveyor stream shall be provided for conveying dewatered gypsum from gypsum vacuum belt filter to over ground storage inside a closed storage shed preferably near plant boundary . The storage shed shall be sized for 7 days of gypsum production with all the units in operation. Gypsum from storage shed shall be loaded to user's trucks using front end loader/ pay loader.
103.	Secio n-VI, Part B	I-M6	4.11.3 (vii)	16 of 73	Feeder carriage drive shall be suitably designed so that the forward & reverse movement of carriage can be achieved without stopping the scooping operation. Tank filled with water in DS system shall also be considered for travel	Feeder carriage drive shall be suitably designed so that the forward & reverse movement of carriage can be achieved without stopping the scooping operation.

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104.	Section n-VI, Part B	I-M6	4.20.00	27 of 73	Dry type dust extraction system shall be provided. New Clause: Crushed Lime Stone Storage Silo: The crushed lime stone storage silo shall be fabricated of minimum 10 mm thick carbon steel with a SS lining of grade SS 304 of minimum 4 mm thickness in the complete conical portion to ensure reliable discharge of material. The design of storage silos shall confirm to IS 9178 (part 1 of 3)
105.	Section -VI, Part A	III-A5	2.01.13	4 of 6	One (1) nos. of lime sampling unit, for as received limestone in crusher house complete with all accessories and electrical, civil, structural works, supporting structures, approach/ maintenance platforms, hoists etc. Two (2) nos. of lime sampling units, one for as received limestone in crusher house and one for as used limestone in TP before feeding to limestone bunkers, complete with all accessories and electrical, civil, structural works, supporting structures, approach/maintenance platforms, hoists etc.
106.	Sl. No.-178 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		107 of 117		The duct to Absorber inlet thickness. The duct from Absorber outlet to the new wet flue chimney shall be made of Carbon steel of minimum 7mm thickness clad with 2 mm (minimum) thickness Alloy C276 / Alloy 59 / Titanium Gr-II. The duct to Absorber inlet thickness. The duct from Absorber outlet to bypass duct shall be made of Carbon steel of minimum 7mm thickness clad with 2 mm (minimum) thickness Alloy C276 / Alloy 59 or better material.
107.	VII/B	I-M1	31 of 51	10.01.00	Slurry & Process Water Tanks: All the slurry tanks.....valves etc.
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					Coarse- screen(s) at suction-side of these pumps shall be provided.	All the slurry tanks.....valves etc. Coarse- screen(s) at suction-side of slurry recirculation pumps shall be provided.
108.	V/B	I-M1	34 of 51	13.03.07	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, erected and tested in accordance with the IS: 803, latest edition. Additional Corrosion allowance of 1.5 mm on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Contractor. Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The tanks shall be of welded construction. Interior surface of the tanks shall lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 4 mm thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc.	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS: 803, latest edition. Additional Corrosion allowance of 1.5 mm on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Contractor. Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The tanks shall be of welded construction. Interior surface of the tanks shall lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 4 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness or Epoxy lining minimum three coats of 150 micron thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc.
109.	V/A	III-A1	7 of 9	11.01.00	Contractor shall provide buildings for Limestone Grinding System: Slurry re-circulating pumps &	Contractor shall provide buildings for Limestone Grinding Svstem. Compressors.

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					Oxidation blowers / Compressors; Gypsum Dewatering System & FGD control room & Analyser room (if required). The buildings must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipments of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.	Gypsum Dewatering System & FGD control room. Slurry re-circulating pumps & Oxidation blowers shall be located in a shed provided with roof sheeting. The buildings/structure must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.
110.	VII/A	III-A1	4 of 9	4.01.11	All Slurry re-circulating slurry pumps & Oxidation blowers shall be installed inside a building to be provided by the Contractor as per specifications specified elsewhere. <i>All pumps & Oxidation blowers shall be in straight line.</i> The building must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc. The building shall be sufficiently ventilated.	All Slurry re-circulating slurry pumps & Oxidation blowers shall be installed in a shed provided with roof sheeting to be provided by the Contractor as per specifications specified elsewhere. All pumps & Oxidation blowers shall be in straight line, however, if it is not possible due to layout constraints, in such case, arrangement for handling & maintenance should be properly & optimally designed. The shed must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.

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111.	VII/B	10 of 51	4.02.00 (iv)		Margin over pressure requirement: 44% over the calculated value	Margin over pressure requirement: Bidder shall consider the margin over pressure requirement as 44% over the calculated head value excluding the static head. Margin on Static head shall be taken as 10%. For bubbling type Absorber, Bidder shall consider choking/blockage of 10% sparger tubes while calculating the head requirements of fan.
112.	VII/B	I-M1	30 of 51	8.04.00	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized valves shall be shall be taken from the process water supply	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized/pneumatic valves shall be shall be taken from the process water supply. The process water lines shall be provided with pneumatic/motorized valves as per the proven practice of the Bidder.
113.	VII/A	III-A1	7 OF 9	7.08.00	All the storage tanks shall be lined with vinyl ester based flake glass lining from inside.	All the storage tanks shall be lined with replaceable chlorobutyl /bromobutyl rubber lining of minimum 4 mm thickness or with vinyl ester based flake

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114.	V/I/B	I-M1	26 of 51	7.04.03	The complete frame of the filter and all parts in contact with gypsum shall be made of corrosion resistant material or shall be provided with corrosion resistant liners of proven design.	glass lining of minimum 3 mm thickness from inside. The complete frame of the filter and all parts in contact with gypsum shall be made with corrosion resistant material .
115.	V/I/B	I-M1	14 of 51	5.01.00(B)	Bubbling Type Absorber (i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and nozzles shall be required in such case. However, 2x 100% Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping for cooling pump discharge shall be made of Alloy 59 or C276 and nozzles shall be made of Silicon Carbide or ceramic or equivalent having a minimum guaranteed life of 20,000 hrs. The Cooling Pumps shall be installed inside a building. The sparger minimum life of 5 years. Minimum 10% Sparger Tubes.	Bubbling Type Absorber (i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and nozzles shall be required in such case. However, 3 x 50% Gas Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping which are in contact with hot flue gas shall be made of Alloy 59 or C276 and nozzles shall be made of Silicon Carbide or ceramic or equivalent having a minimum guaranteed life of 20,000 hrs. Cooling Pump discharge piping and valves outside the flue gas path shall be in line with the requirements

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						specified for slurry recirculation pumps. The Cooling Pumps shall be installed in a shed with roof sheeting. The sparger minimum life of 5 years. Minimum 10% Sparger Tubes.
116.	VII/A	IV	1 of 3	1.02.00	Flue Gas Duct (i) Un cleaned Flue Gas For each unit: i) One tapping from the common Flue Gas Duct going towards the existing Chimney (in case of twin flue chimney). No load of duct shall be transmitted on the Employers facilities. ii) One tapping on the Employers facilities.	Flue Gas Duct (i) Un cleaned Flue Gas For each unit: i) One/two tapping (depending on layout feasibility owing to space limitations and subject to Employer's approval) from the Flue Gas Duct going towards the existing Chimney. No load of duct shall be transmitted on the Employers facilities. ii) One tapping on the Employers facilities.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
117.	VI/B	I-M1	2 OF 51	1.03.02	The FGD system shall be ... whenever the Steam Generator is in operation. However, provision shall the gas side, with the unit in operation. For this purpose. Motorized Guillotine type gates at (i) hot gas inlet to Booster Fans, (ii) Outlet of Booster Fans and (iii) in the bypass duct (common Flue Gas Duct going towards the existing Chimney). Further, Quick opening Bi-plane designing the control & logics for the FGD System.	The FGD system shall be ... whenever the Steam Generator is in operation. However, provision shall the gas side, with the unit in operation. For this purpose. Motorized Guillotine type gates has be provided at (i) hot gas inlet to Booster Fans, (ii) Outlet of Booster Fans, (iii) in the bypass duct (common Flue Gas Duct going towards the existing Chimney). Further, Quick opening Bi-plane designing the control & logics for the FGD System.
118.	VI/B	I-M1	7 OF 51	3.03.01	The arrangement of the flue gas system shall at the outlet of each Booster fan. A gas tight, motor operated Guillotine gate shall be provided by the Contractor in the bypass duct (flue gas duct connecting the existing chimney).	The arrangement of the flue gas system shall at the outlet of each Booster fan.

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.	
119.	Sl.no. 177 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		106 of 117	A "wet Chimney" shall be operation. The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation. The wet stack shall be designed as per the guidelines of EPRI Revised Wet Stack Design Guide. Alternatively, ... year full replacement guarantee and fulltime onsite QA supervision, during erection & commissioning, by the supplier of the lining system. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet.< 18 at Design Point	A "wet Chimney" shall be operation. The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. The top flue liner above the roof slab shall be made of solid C276 / Titanium (Grade 2 as per ASME SB265) of minimum 10 mm thickness. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation. The wet stack shall be designed as per the guidelines of EPRI Revised Wet Stack Design Guide. Alternatively, ... year full replacement guarantee and fulltime onsite QA supervision, during erection & commissioning, by the supplier of the lining system. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet.
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS				AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Page 47 of 60
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AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.		
120.	Sl.no. 176 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		106 of 117	All the gates shall be designed for tight shut off. The Guillotine gate type dampers mentioned at condition without the use of seal air fans of the damper. The Guillotine gates shall also be provided with a 2X100% complete seal air system. The bypass damper shall minimum one type of damper of each type and size.	 18 at Design Point
121.	Sl.no.05 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-04(T)			Waste Water The Contractor guarantees that the maximum purge flow rate to waste water treatment system for Barh-I (3X660 MW) shall be 30 m ³ /hr averaged over a 24 hour period and for Nabinagar (4x250 MW) shall be 20 m ³ /hr averaged over a 24 hour period.	Waste Water The Contractor guarantees that the maximum purge flow rate to waste water treatment system shall be 10m³/hr (except for BRBCL where it shall be less than 5 m³/hr) averaged over a 24 hour period from each unit.

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
122.	Sl.no. 144 AMENDMENT NO. CS-0011-109(1A)-2-AMDT-03(T)		94 of 117		Clean gas from the absorber shall be taken to the Wet Chimney, to be provided by the Contractor, through three stage mist eliminators. Provision shall be made for facilitating operation of unit with FGD bypass through existing stack. All modifications required including providing bypass damper & Gate is included in the scope of the Contractor.	Clean gas from the absorber shall be taken to the Wet Chimney, to be provided by the Contractor, through three stage mist eliminators. Provision shall be made for facilitating operation of unit with FGD bypass through existing stack. All modifications required including providing bypass damper is included in the scope of the Contractor.
123.	V/I/B	I-M1	14 of 51	5.01.00 A (iv)	(iv) The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side.	(iv) The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side. In order to optimise power consumption of FGD system at part load operation, Bidder to provide atleast one slurry recirculation pump preferably lower level with Variable Frequency Drive (VFD).
124.	V/I/B	I-M1	31 of 51	10.01.00	The tanks shall be of welded construction. Interior surface of the tanks shall be lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 5 mm thickness and the outside surface shall be coated with paint as approved by the Employer	The tanks shall be of welded construction. Interior surface of the tanks shall be lined with the following: - Wastewater tank , Filtrate tank, Secondary hydro cyclone feed tank : Vinyl ester based Flake lining of min 3 mm thickness

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
						Slurry tanks : Replaceable chlorobutyl /bromobutyl Rubber lining of minimum 4 mm thickness The outside surface of the tanks shall be coated with paint as approved by the Employer. Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The contractor may provide a recirculation line with motorized isolation valve / restriction orifice made of erosion resistant material for the above purpose. Flanged valves shall be rated at no less than ANSI press class of 150 lbs. GA Drawing & Datasheet of Hoist for Ball Mill Building GA & Datasheet of Hoist In case the absorber is equipped with several spray levels they shall be designed as follows: (i) For spray type Absorber, the last spray level upstream the mist eliminator shall be operated only in counter flow. (ii) (iii)
125.	VII/B	I-M1	33 of 51	12.01.00	Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The contractor may provide a recirculation line with motorized isolation valve for the above purpose.	
126.	VII/B	III-C7	2 of 5	2.09.00	Flanged valves shall be rated at no less than ANSI press class of 300 lbs.	
127.	VII/B	-I-M9	15 of 24	MDL 387 388	GA Drawing & Datasheet of 12T Hoist for Ball Mill Building GA & Datasheet of 25T Hoist	
128.	VI	I-M1	19 of 51	5.06.18	In case the absorber is equipped with several spray levels they shall be designed as follows: (i) The last spray level upstream the mist eliminator shall be operated only in counter flow. (ii) (iii) (iv)	

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
						(iv)
129.	VI	I-M1	8 of 51	4.01.01 3(iii)	Pressure at Booster Fan suction	0 mmWc
130.	VI/B	I-M1	27 of 51	7.07.05	The secondary wastewater underflow shall be taken to the adequately sized filtrate tank, while the overflow shall be taken to a wastewater tank.	The secondary wastewater underflow shall be taken to the adequately sized filtrate tank while the overflow shall be taken to a wastewater tank. In case Bidder opts to provide additionally Lamella separator before the waste water tank and after the secondary hydro cyclone for removing impurities from the system, the solids concentration in waste water up to max 10% can be acceptable .However, the required moisture content in Gypsum & required Gypsum quality shall be complied.
131.					ZLD envisaged for Barh (3x660 MW) & BRBCL (4x250MW)	ZLD stands deleted for both these projects (Barh-I (3x660 MW) & BRBCL (4x250MW)). Accordingly, all clauses and Drags indicated in the specification pertaining to ZLD will not be applicable and clauses and drgs indicated in the

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
132.	VII/A	IV	2 of 3	1.08.00	Waste Water FGD waste water pipes shall terminate along with isolation valve at 5 Meters near HCSD Mixing Tank , and 300 mm above FFL in HCSD Silo Area. Pressure at terminal point shall be 3.0 kg/cm2(g) , pH shall be 7.0 (approx.) and temperature shall be <50-60°C. For (Barh-I (3x660 MW) & BRBCL (4x250MW)):- FGD waste water pipes shall terminate along with isolation valve ash slurry sump. PH shall be 7.0 (approx.) and temperature shall be <50-60°C at terminal point.	specification related Wastewater treatment system shall be applicable to these two projects also. Waste Water FGD waste water pipes shall terminate along with isolation valve at 5 Meters near HCSD Mixing Tank , and 300 mm above FFL in HCSD Silo Area. Pressure at terminal point shall be 3.0 kg/cm2(g) , pH shall be 7.0 (approx.) and temperature shall be <50-60°C.
133.	VII/A	VII	1 of 61	1.01.00 a)	The list of mandatory spares considered essential by the Employer is indicated in the list enclosed to this Sub-Section. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of Mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares	The list of mandatory spares considered essential by the Employer is indicated in the list enclosed to this Sub-Section. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of Mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS BIDDING DOCUMENT NO.: CS-0011-109(1A)-2						AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T) Page 52 of 60

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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					shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms & Price Schedules. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.	price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish total population of each item for the project in the Bid Forms & Price Schedules. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.
134.	VII/A	VII	6-11 of 61	1.01.00-1.17.00	Mandatory Spares List (For each Project) Cl. No. 1.01.00 to 1.17.00	Mandatory Spares List (For each Project) - Cl. No. 1.01.00 to 1.17.00 revised attached as Mech Annexure III
135.	VII/A	VII	44 of 61	Note to cl. No. 1.24.00	Note	Add below Note:- 6. Wherever rubber part viz: coupling, V belt, flexible hose etc have been used ,minimum quantity as specified above is to be supplied and any item which is not covered above minimum 10% or 01 no whichever is higher is to be supplied. 7. Wherever nonmetallic fabric/paper filter etc have been used ,minimum quantity as specified above is to be supplied and any item which is not covered above minimum 10% or 01 no whichever is higher is to be supplied 8. Any special tool required for maintenance of any of the equipment being supplied is to be included in
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS BIDDING DOCUMENT NO.: CS-0011-109(1A)-2					AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Page 53 of 60

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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						mandatory T&P along with the equipment.
136.	Section-VI, Part A	VI	5.00.00	20-23 of 24	AUXILIARY POWER CONSUMPTION(PA) FOR EACH PROJECT	Revised AUXILIARY POWER CONSUMPTION (PA) FOR EACH PROJECT is enclosed at Mech Annexure-IV
137.					--	In case distance from Limestone Grinding system/ Gypsum Dewatering and Absorber is more than 500M, Bidder shall provide the following :- Flushing system at intermittent locations for the lime stone slurry pipeline which shall contain tank and pumps. Intermittent location distance of flushing system shall be based on their proven practice.
138.	VI/B	I:M9	1 to 24 of 24	MDL List	MDL List no. 213.Motor for Booster Fan - Sub QR documents of M/s Crompton Greaves Ltd., Bhopal 214. Motor for Booster Fan - Sub QR documents of M/s Weg, Hosur 215. Motor for Booster Fan - Sub QR documents of M/s Crompton Greaves Ltd., Mandideep 433. Oxidation Blower - Sub QR documents of M/s ITO, Japan 434.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Thysencrupp, Germany	MDL List no. 213.Motor for Booster Fan - Sub QR documents 214. Motor for Booster Fan - Sub QR documents 215. Motor for Booster Fan - Sub QR documents 433. Oxidation Blower - Sub QR documents 434.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents 435.Recirculation Slurry Pump - Sub QR documents 436.Booster Fan - Sub QR documents

FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS**AMENDMENT NO.****CS-0011-109(1A)-2-AMDT-05(T)****Page 54 of 60****BIDDING DOCUMENT NO.: CS-0011-109(1A)-2**

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					435.Recirculation Slurry Pump - Sub QR documents of M/s DUCHTING PUMPEN, GERMANY 436.Booster Fan - Sub QR documents of M/s Solyvent Flakt AB, Sweden 437.Slurry Pump - Sub QR documents of M/s Duchting Pumpen, Germany 438.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Metso, USA 439.Agitators - Sub QR documents of M/s EKATO RMT GMBH. Germany 440.Vaccume Belt Filters -Sub QR documents of M/s Shanghai Xuhe Environmental Technology Co. Ltd., Shanghai, China 441.Vaccume Belt Filters -Sub QR documents of M/s FLSmith, USA 442.Agitators - Sub QR documents of M/s Zhejiang Greatwall Reducer Mfg Co. Ltd. 443.Gas to Gas Heat Exchanger (GGH) - Sub QR documents 444.Slurry Pump - Sub QR documents of M/s Weir Minerals, USA 445.Slurry Pump - Sub QR documents of M/s Sam Turbo Industries Pvt. Ltd., Koimbatoor 446.Booster Fan - Sub QR documents of M/s Sueswon Poongryuk Machinery Co. Ltd, Korea 447.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Cemtec, Austria	437.Slurry Pump - Sub QR documents 438.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents 439.Agitators - Sub QR documents 440.Vaccume Belt Filters - Sub QR documents 441.Vaccume Belt Filters - Sub QR documents 442.Agitators - Sub QR documents 443.Not used 444.Slurry Pump - Sub QR documents 445.Slurry Pump - Sub QR documents 446.Booster Fan - Sub QR documents 447.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Cemtec, Austria 448.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Christian Pfeiffer Maschinenfabrik Austria 449. Oxidation Air Blower - Sub QR documents of m/s Siemens Turbo Machinery / HV Turbo 602. MQP for PDB of M/s pyrotech Electronics Udaipur 628. MQP for foundation bolts M/s Quality Engineering Works, Kolkata 629. MQP for foundation bolts M/s Indiana Conveyors, Jejuri 671. MQP for Ball Valve (M/s Leader) -All drgs pertaining to GGH stands deleted

FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS**BIDDING DOCUMENT NO.: CS-0011-109(1A)-2****AMENDMENT NO.****CS-0011-109(1A)-2-AMDT-05(T)****Page 55 of 60**

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					448. Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Christian Pfeiffer Maschinenfabrik Austria 449. Oxidation Air Blower - Sub QR documents of m/s Siemens Turbo Machinery / HV Turbo 602. MQP for PDB of M/s pyrotech Electronics Udaipur 628. MQP for foundation bolts M/s Quality Engineering Works, Kolkata 629. MQP for foundation bolts M/s Indiana Conveyors, Jejuri 671. MQP for Ball Valve (M/s Leader) -All drgs pertaining to GGH	
139.	V/A	A -10	14 of 24		Drawing not attached	The drawing for Equipment layout at EL 0.0M (Drg. no. 9558-999-POM-A-001) for Barh-1 project is attached as Mechanical Annexure V
140.					Barh-I (3X660MW) clauses and drgs indicated considering that FGD outlet will led to New Chimney.	Barh-I (3X660MW) clauses and drgs revised considering that FGD outlet will led to existing chimney and accordingly absorber discharge will be connected to ID fan discharge duct with additional damper(s). Bypass duct from bypass damper to chimney and existing chimney shall be lined. Further, Condensate

FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS**AMENDMENT NO.****CS-0011-109(1A)-2-AMDT-05(T)****Page 56 of 60****BIDDING DOCUMENT NO.: CS-0011-109(1A)-2**

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
141.	VII/A	I	9 of 19	4.01.07	In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.01 (e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps and slurry pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (e) above for the Slurry Recirculation Pumps. Before ---- equipment.	draining system and condensate study shall also be in the bidder's scope. Sketch and details are enclosed at Mechanical Annexure-VI.
142.	VII/A	V	10 of 26	Notes for clause no. 6.000	Notes:- 3.For the purpose of sizing of equipments and guarantee, MgCO ₃ shall be considered as unreactive dolomitic form.	Following note is added. Note:- 3.For the purpose of sizing of equipments and guarantee, MgCO₃ shall be considered as unreactive dolomitic form.
142 (a)	VII/B	I-M1	8 of 51	4.01.00	The Booster -----specified range of fuels. Additionally a pressure loss of 100 mm wcl (excluding margin) shall be built up in booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-NO _x system.	The Booster -----specified range of fuels. Additionally a pressure loss of 100 mm wcl (including margin) shall be built up in both booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-NO _x system.
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS BIDDING DOCUMENT NO.: CS-0011-109(1A)-2					AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Page 57 of 60

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					De-Nox system.	
142 (b)	VII/A	III-A1	9 of 9	25.00.05	A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided. Storage tank/neutralization tank shall be complete with dosing, mixing and preparation system. After neutralization of the stack condensate collection, same shall be pumped to common drain system. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc. Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration. All the material in contact with the condensate shall be of suitable material for the operating duty. Bidder should provide the condensate collection system such that the condensate collected shall be routed to absorber by gravity, bidder should ensure safe discharge to the absorber. However, in-case of the distance between absorber and wet stack is considerably far, bidder should provide the condensate collection system such that condensate shall be collected in a storage tank and pumped to absorber. Tank shall be placed at zero meter with a capacity 5 m3/hr along with associated pumping system. A common storage tank for the both the units of storage capacity of 5 m3/hr of stack condensate of both the stack shall be provided. Storage tank shall be complete with stack condensate collection be pumped to absorber. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc. Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration. All the material in	
FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS BIDDING DOCUMENT NO.: CS-0011-109(1A)-2						AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T) Page 58 of 60

AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
142	SI. No.-165		101 of 117			contact with the condensate shall be of suitable material for the operating duty.
(c)	AMENDMENT NO.					
	CS-0011-109(1A)-2-AMDT-03(T)					2x100% electric driven, single stage, integrally geared, single or dual vane centrifugal type / positive displacement (Helical lobe) type with VFD drive , oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber reaction tank.
143.	SECTI ON-VI, PART-B	I-M1	33 OF 51	12.02.00		All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The Contractor can provide slurry pipes of size lower than 300 NB made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same. Outer surface of the pipes should be fire retardant.
144.	V/I/B	I-M1	19 of 51	5.06.11 & Refer the SI.No.178 of Amendme nt No. CS-0011-		The absorber vessel shall be made of minimum 7 mm thick carbon steel. The absorber oxidation tank, absorber tower & absorber outlet duct up to absorber outlet flange shall be provided with 2 mm (minimum) thickness lining / cladding / Alloy C276 / Alloy 59 or better material.

FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE FOR LOT 1A PROJECTS
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AMENDMENT NO. 5 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
145.	VII/B	I-M1	17.01.00	109(1A)-2-AMDT-03(T) 42 of 51	Thermal Insulation along with aluminum cladding shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius.	Thermal Insulation along with aluminum cladding shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius except for absorber. Further, Thermal insulation of min 70 mm shall be provided for absorber outlet flue gas duct irrespective of skin temperature.

NEW NABINAGAR STPP**SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

The various site specific seismic parameters for the project site shall be as follows:

1)	Peak ground horizontal acceleration (MCE)	: 0.16g
2)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a)	for special moment resisting steel frames designed and detailed as per IS:800	: 0.04
b)	for special concentrically braced steel frames designed and detailed as per IS:800	: 0.03
c)	for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.024
d)	for RCC chimney	: 0.08
e)	For Liquid retaining tanks	: 0.048
f)	for Steel chimney, Absorber tower, Vessels	: 0.06
g)	for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.04
3)	Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.08

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

NABINAGAR STPP**Civil Annexure-4****SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

The various site specific seismic parameters for the project site shall be as follows:

1) Peak ground horizontal acceleration (MCE)	: 0.16g
2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a) for special moment resisting steel frames designed and detailed as per IS:800	: 0.04
b) for special concentrically braced steel frames designed and detailed as per IS:800	: 0.03
c) for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.024
d) for RCC chimney	: 0.08
e) For Liquid retaining tanks	: 0.048
f) for Steel chimney, Absorber tower, Vessels	: 0.06
g) for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.04
3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.08

Note:

1. g = Acceleration due to gravity.
2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
13.	PART-A	III-A5	1 OF 6	1.01.00	Based on site visit, bidder shall submit layout for Limestone handling plant & Gypsum handling facilities along with their techno-commercial bid. Bidder shall bring out all necessary modification and relocation of existing facilities, if required, along with proposed Layout submitted with the bid	We understand any modification and relocation is not in the scope of this package. Please confirm	All required modification and demolition work of existing facilities shall be in the bidder's scope. However if any relocation of existing facility is required, the same shall be done by the employer.
14.	PART-A	III-A5	2 OF 6	2.01.01	Based on site visit, bidder shall submit layout for Limestone handling plant & Gypsum handling facilities along with their techno-commercial bid. Bidder shall bring out all necessary modification and relocation of existing facilities, if required, along with proposed Layout submitted with the bid	Request customer to furnish the drawings of the existing facilities to study the modification required in the existing facility.	Bidder shall refer the GLP drawing attached with the tender documents and shall also visit the site to study existing facilities that require modification.
15.	PART-B	IV-D	23 OF 69	5.07.00	Polycarbonate sheet of 3 mm thick....	We propose to use 2 mm thick polycarbonate sheets. Please confirm.	Bidder shall comply with technical specification requirement

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
16.	PART-B	IV-D	30 OF 69	11.00.00	Fencing around lime storage/ gypsum storage area.	We do not understand the requirement of any fencing in these areas. Kindly review the requirement and confirm.	Refer Scope of work. Refer clause 2.00.00, Section-VI, Part-A of technical specification.
17.	PART-B	IV-D	8 OF 69	3.07.00	Gypsum storage shed- Gypsum storage shed shall be of RCC –framed structure with steel structure framed structure-----	Details specified for gypsum storage shed is not clear. Please furnish the detail specification for the gypsum storage shed. We propose to use space frame structure with bolted joints. Please confirm.	Bidder to refer amendment in this regard.
18.	PART-A	III-A5	3 OF 6	2.01.07	Crushed limestone reclaim hopper(RH silo)Machinery hatch---	Please furnish the detail specification for the lime stone storage shed. We propose to use space frame structure with bolted joints. Please confirm.	Bidder to refer necessary amendment in this regard.
19.	PART-A	III-A5	3 OF 6	2.01.10	Suitable no. of motorized travelling tripper /flow diverter----feeding the crushed limestone to limestone shed	We understand that intermediate supporting trestle can be provided for the supporting of tripper conveyor gallery inside lime stone shed. Please confirm.	Confirmed. However adequate space for movement of dozer/payloader shall be provided.
20.	PART-A	III-A5	60F6	3.06.00	Suitable no. of motorized travelling tripper /flow diverter	We understand that intermediate supporting trestle can be provided	Confirmed. However adequate space for movement of dozer

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
					er----feeding the gypsum to gypsum shed.	for the supporting of tripper conveyor gallery inside gypsum shed. Please confirm.	er/payloader shall be provided.
21.	PART-B	IV-D	8 OF 69	3.07.00	Gypsum storage shed- Gypsum storage shed shall be of RCC –framed structure with steel structure framed structure-----	We understand that for the gypsum stock pile area no PCC/RCC paving is required. Only leveling and grading of gypsum stockpile area is needed.	Bidder to refer amendment in this regard.
22.	PART-A	III-A5	3 OF 6	2.01.07	Crushed limestone reclaim hopper(RH silo)Machinery hatch---	We understand that no retaining wall and peripheral drain needed around lime stone stock pile and gypsum stock pile please confirm.	Bidder's understanding is not correct. Retaining wall and peripheral drain around lime stone stock pile and gypsum stock pile along with suitable entry point for dozer entry with ramp need to be provided by the successful bidder.
BARH							
23.	VI/PART-A	II-A10	1 OF 30	1.05.00	Railway siding.	We understand that work of railway siding is not in the scope of bidder. Kindly confirm our understanding is correct.	Bidders understanding is correct.
24.	VI/PART-A	II-A10	10 OF 30	7.01.00	FGL generally corresponds to RL 46.20M-----to achieve the FGL as indicated above.	Please furnish the topographical survey drawing and contour drawings of the site.	Bidder to refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
78.	VI/B	IV-D	26 of 69	10.00.00	Site levelling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
79.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
80.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
81.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Type of cladding system if not specified in the technical Specification shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any).
82.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Extent and type of paving in FGD block shall be in accordance with Technical specification. However, any functional requirement of paving for FGD facilities not specifically mentioned in technical specification is also in the scope of bidder.
83.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL-SOLAPUR

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/PART	SUB-SEC.	PAGE NO.	CLAU SE NO.			
87.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
88.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
89.	VI/B	IV-D	31 of 69	14.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
90.	VI/B	IV-D	41 of 69	21.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately
91.	VI/B	IV-D	24 of 69	7.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl. No.81

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAU SE NO.			
92.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection... The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl. No.82
93.	VI/B	IV-D	25 of 69	7.00.00		Annexure-IV is not available in the specification. Please provide the same.	Bidder to refer amendment in this regard.
94.	VI/A	II-A6	9 of 31	7.00.01	Geotechnical data and foundation system for the respective project are enclosed at annexure-III. The corresponding bore logs are enclosed at annexure-IV.		

CIVIL-MEJA

SL.	ENQUIRY SPECIFICATION	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



NO	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
95.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
96.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
97.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
98.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
99.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl. No. 81
100.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl.No.82
101.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		Refer Sl.No.82

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL-BARH

SL. NO	SEC/ PART	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
		SUBSEC.	PAGE NO.	CLAUSE NO.			
102.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing. Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
103.	VI/B	IV-D	26 of 69	10.00.00		In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
104.	VI/B	IV-D	31 of 69	14.00.00		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
105.	VI/B	IV-D	41 of 69	21.00.00	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
106.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	Refer Sl.No.81

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
107.	VI/B	IV-D	25 of 69	7.00.00	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
108.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection... The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.	Any suitable slope protection works can be provided. Please confirm
109.	VI/A	II-A10	10 OF 30	7.02.00	For excavation 6 metres below FGL, sheet piling shall be provided.	Excavation may be carried out by using either sheet piling/ diaphragm wall/ secant piling/ contiguous piling or their combination. Bidder to refer amendment in this regard.
110.	General	-	-	-	Topographical survey details is not available in the specification. Please furnish the same.	Bidder to refer amendment in this regard.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL TANDA

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
111.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
112.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
113.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
114.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
115.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).
116.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
117.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain. protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	
118.	VI/A	II-A7	22 OF 33	Annexure-III, e)	The minimum pile length for each group of piles shall be determined based on the nearest bore log. A minimum embedment of 4.0m into the very dense sand strata with SPT 'N' value greater than 50 as observed in such bore log shall be ensured, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby bore log data. The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL NPGCPL NABINAGAR

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
121.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
122.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
123.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.		
124.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
125.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding). Refer Sl.No.81

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
126.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl.No.82
127.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		
128.	VI/A	II-A8	9 OF 31	ANNEX-URE-B	a) The basic wind speed "Vb" at ten	Kindly specify the basic wind speed.	The basic wind speed "Vb" at 10m height above the mean ground level for "NABINAGAR-I 3X660 MW" project shall be 47 metres/second. Also refer Amendment issued separately in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.		
129.	VI/A	II-A8	21 OF 31	Annex-ure-III, e)	The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
130.	VI/A	II-A8	13 OF 31	7.02.03 xv	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Bidder may conduct either static routine load test or high strain dynamic load test. Bidder to refer amendment in this regard.
131.	General	-	-	-	-	Lab test results of geotechnical investigation may please be furnished.	Bidder to refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUB- SEC.	PAGE NO.	CLAUSE NO.			
132.	General	-	-	-	-	Topographical survey details is not available in the specification. Please furnish the same.	Bidder to refer amendment in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



CIVIL BRBCL NABINAGAR

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
133.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
134.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
135.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
136.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		
137.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer SI.No.81

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
138.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
139.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		
140.	VI/A	II-A11	22 OF 29	Annexure-III, e)	The minimum pile length for each group of piles shall be determined based on the nearest bore log. Pile shall be socketed into yellowish weathered sand stone. A socketing length of four (4) times the diameter of the pile into rock with rock core recovery $\geq 20\%$ shall be ensured for 600 mm & 760 mm dia piles.	The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.



CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects

CIVIL BRBCL (MOUDA, SOLAPUR, MEJA, BARH, TANDA, NPGCPL NABINAGAR & BRBCL NABINAGAR)

SL. NO	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
143.							
144.	VI / A	V	8 OF 26	5.01.00	A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor...	The location of new Wet Chimney shall be near to Existing Chimney in the space provided clearing foundation interface. The design of Wet Chimney shall be done considering interface factor of existing chimney as determined by wind tunnel study. However, no design check or validation shall be done for existing chimney/structures/buildings. Kindly confirm.	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).



CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects

TENDER NO PSE:R:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
212.	Section-VI, PART-A	Sub-Section-VII	39 OF 61	K	Mandatory Spares of Limestone & Gypsum Handling: ELECTRIC HOISTS	ified in referred clause. In case the same has to be considered, then kindly inform about applicable list of mandatory spares to be followed. 4) Further, no spares are mentioned for chain pulley blocks. We understand that no spares shall be provided for chain pulley blocks. Please confirm.	Confirmed.
213.	VI/A	III-D	2 of 4	1.06.00	CIVIL Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.		FGD is indicated in General Layout plan

TENDER NO PSE:R:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
214.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing..	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.
215.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBNC-2059:20

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
216.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

TENDER NO PSER:SCT:NBNC-2059:20

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
217.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer Sl.No.81

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
218.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection... The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer Sl.No.82
219.	VI/B	IV-D	25 of 69	7.00.00			

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TENDER NO PSER:SCT:NBNC2059:20

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
220.	VI/A	II-A4	10 of 30	7.00.01	Geotechnical data and foundation system for the respective project are enclosed at annexure-III. The corresponding bore logs are enclosed at annexure-IV.	Annexure-IV is not available in the specification. Please provide the same.
221.	SEC VI / PART B	I M1	6 OF 51	3.02.07	External surface of the chimney flue liner projecting over the chimney roof shall be wrapped with 2mm thick titanium/ C276 sheet over insulation.	No painting is required on external surface of chimney flue liner projecting above chimney roof. Also refer Amendment in this regard.
222.	SEC VI / PART B	IV D	15 OF 69	3.14.09 (iv)	, external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.	These clauses are contradictory. Bidder understands that if 2mm thick titanium/ C276 sheet wrapping over insulation is provided then no painting is required on external surface of the chimney flue liner projecting over the chimney roof. Please confirm.

TENDER NO PSER:SCT:NBNC2059:20

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
223.	SEC VI / PART A	V	8 OF 26	5.01.00	External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation.		
224.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Bidder understands that cladding can be done with explosion bonding or hot rolling or combination of both to achieve the required quality as per ASTM B 898-11. Please confirm.	Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
225.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		
226.	SEC VI / PART B	IV D	39 OF 69	20.00.00	Electrodes	Please provide the detail/type of electrodes to be used in welding of titanium/C276.	Type of electrode will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
227.	SEC VI / PART B	IV D	39 OF 69	20.07.00	Edge Preparation for Welding	Please provide edge preparation detail for titanium/C276 material.	Edge Preparation detail will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
228.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Please provide the material code to be followed for alloy C-276.
229.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Specification requirement is clear. Bidder shall comply with the specification requirements.

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TENDER NO PSER:SCT:NBNC2059:20

TENDER NO PSER:SCT:NBNC2059:20

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
230.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. Kindly furnish the following specifications for chimney liners. 1. Permissible tolerances on thickness of clad sheet and base material. 2. Permissible tolerances on flatness for clad sheet and base material. 3. Specify the quality tests which will be conducted on the clad sheet for assessing mechanical and chemical properties and on the chimney cans after fabrication. 4. Indicate any special requirements applicable for welding and fabrication of chimney at site. 5. Indicate any restriction in size of base metal and clad plate to be used for fabrication of flue cans. 6. Mention tensile and yield strength of the clad material to be achieved.	Specification requirement is clear. Bidder shall comply with the specification requirements.
231.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	

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CLARIFICATION No.01 (TECHNICAL)
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TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
232.	SEC VI / PART A	I	10 OF 19	4.02.03	For Chimney, Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.	Bidder understands that, there is no other prequalification requirements related to fabrication and erection of titanium/c276 clad steel flue liner in chimney. Please confirm.
233.	SEC VI / PART B	IV D	2 OF 69	2.03.00	Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.	
234.	VI / A	V	8 OF 26	5.01.00	A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor...	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).

TENDER NO PSER:SCT:NBN-C2059:20

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
268.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
269.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
270.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
271.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.
272.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colored coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer SI.No.81

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSE/ER:SCT:NBN-C2059:20

TENDER NO PSE/ER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
273.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
274.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
275.	VI/A	II-A3	22 OF 31	Annexure-IV, e)	The minimum pile length for each group of piles shall be determined based on the nearest bore log. A minimum embedment of 2.0m into pebbles/cobbles/boulder strata (river Bed material) as observed in such bore log shall be ensured, while deciding the minimum length of pile. For pile termination, SPT 'N' values shall be used from the nearby bore log data.	The minimum length of pile shall be as per approved geotechnical investigation report during detailed engineering. Please confirm.	Bidder shall comply the provisions of technical specification.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)
Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
276.	VI/A	II-A3	14 OF 31	7.02.03 xv	High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests.	High strain dynamic load test is not required as static routine load test are being carried out in the piles. Please confirm.	Bidder may conduct either static routine load test or high strain dynamic load test. Refer amendment .

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBNC2059:20

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
277.	General	-	-	-	-	Lab test results of geotechnical investigation may please be furnished. These clauses are contradictory. Bidder understands that if 2mm thick titanium/ C276 sheet wrapping over insulation is provided then no painting is required on external surface of the chimney flue liner projecting over the chimney roof. Please confirm.	Bidder to refer amendment. No painting is required on external surface of chimney flue liner projecting above chimney roof. Also refer Amendment in this regard.
278.	SEC VI / PART B	I M1	6 OF 51	3.02.07	External surface of the chimney flue liner projecting over the chimney roof shall be wrapped with 2mm thick titanium/ C276 sheet over insulation., external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.		
279.	SEC VI / PART B	IV D	15 OF 69	3.14.09 (iv)	External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation.		
280.	SEC VI / PART A	V	8 OF 26	5.01.00			

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TENDER NO PSER-SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
281.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Bidder understands that cladding can be done with explosion bonding or hot rolling or combination of both to achieve the required quality as per ASTM B 898-11. Please confirm.	Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.
282.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.
283.	SEC VI / PART B	IV D	39 OF 69	20.00.00	Electrodes	Please provide the detail/type of electrodes to be used in welding of titanium/C276.	Type of electrode will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.

TENDER NO PSER-SCT:NBN-C2059:20

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TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
284.	SEC VI / PART B	IV D	39 OF 69	20.07.00	Edge Preparation for Welding	Please provide edge preparation detail for titanium/C276 material.	Edge Preparation detail will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
285.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Please provide the material code to be followed for alloy C-276.	Specification requirement is clear. Bidder shall comply with the specification requirements.
286.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		

TENDER NO PSER:SCT:NBN-C2059:20

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TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
290.	SEC VI / PART B	IV D	2 OF 69	2.03.00	Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.		
291.	VI / A	V	8 OF 26	5.01.00	A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system by the Contractor...	The location of new Wet Chimney shall be near to Existing Chimney in the space provided clearing foundation interface. The design of Wet Chimney shall be done considering interface factor of existing chimney as determined by wind tunnel study. However, no design check or validation shall be done for existing chimney/structures/buildings. Kindly confirm.	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).

TENDER NO PSER:SCT:NBN-C2059:20

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
328.	VI/A	III-D	2 of 4	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
329.	VI/B	IV-D	26 of 69	10.00.00	Site leveling of gypsum storage area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block. Each block shall be finished to the formation level as specified in drawing...	In tender drawings only space for FGD area is marked. No FGL is mentioned for FGD area blocks. Kindly clarify and furnish the same.	FGL is indicated in General Layout plan
330.	VI/B	IV-D	31 of 69	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75mm/hr. Refer amendment issued separately.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
331.	VI/B	IV-D	41 of 69	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		
332.	VI/B	IV-D	24 of 69	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Refer SI.No.81

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
333.	VI/B	IV-D	25 of 69	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings... All facility buildings shall be provided with 750 mm wide plinth protection all around... An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection... The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved. (2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	Refer SI.No.82
334.	VI/B	IV-D	25 of 69	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.		
335.	VI-A	II-A2	23-39 of 48	Annexure-II	BORE LOG	Geotechnical investigation report is not readable. Please provide the report in readable format.	Bidder to refer amendment.
336.	SEC VI / PART B	I M1	6 OF 51	3.02.07	External surface of the chimney flue liner projecting over the chimney roof shall be wrapped with 2mm thick titanium/ C276 sheet over insulation.	These clauses are contradictory. Bidder understands that if 2mm thick titanium/ C276 sheet wrapping over insulation is provided then no painting is required on	No painting is required on external surface of chimney flue liner projecting above chimney roof. Also refer Amendment in this regard.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
337.	SEC VI / PART B	IV D	15 OF 69	3.14.09 (iv)	, external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.	external surface of the chimney flue liner projecting over the chimney roof. Please confirm.	
338.	SEC VI / PART A	V	8 OF 26	5.01.00	External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation.		
339.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Bidder understands that cladding can be done with explosion bonding or hot rolling or combination of both to achieve the required quality as per ASTM B 898-11. Please confirm.	Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, tests and Quality plan such that it meets the plant operation requirements.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC / PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
340.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		
341.	SEC VI / PART B	IV D	39 OF 69	20.00.00	Electrodes	Please provide the detail/type of electrodes to be used in welding of titanium/C276.	Type of electrode will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
342.	SEC VI / PART B	IV D	39 OF 69	20.07.00	Edge Preparation for Welding	Please provide edge preparation detail for titanium/C276 material.	Edge Preparation detail will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
343.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Please provide the material code to be followed for alloy C-276.	Specification requirement is clear. Bidder shall comply with the specification requirements.
344.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.		
345.	SEC VI / PART A	V	8 OF 26	5.01.00	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Kindly furnish the following specifications for chimney liners. 1. Permissible tolerances on thickness of clad sheet and base material. 2. Permissible tolerances on flatness for clad sheet and base material. 3. Specify the quality tests which	Specification requirement is clear. Bidder shall comply with the specification requirements.

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC / PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
346.	SEC VI / PART B	I M1	6 OF 51	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	will be conducted on the clad sheet for assessing mechanical and chemical properties and on the chimney cans after fabrication. 4. Indicate any special requirements applicable for welding and fabrication of chimney at site. 5. Indicate any restriction in size of base metal and clad plate to be used for fabrication of flue cans. 6. Mention tensile and yield strength of the clad material to be achieved.	
347.	SEC VI / PART A	I	10 OF 19	4.02.03	For Chimney, Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.	Bidder understands that, there is no other prequalification requirements related to fabrication and erection of titanium/ c276 clad steel flue liner in chimney. Please confirm.	Bidder's understanding is Correct.
348.	SEC VI / PART B	IV D	2 OF 69	2.03.00	Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.		

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SL. NO	ENQUIRY SPECIFICATION			SPECIFICATION REQUIREMENT	COMMENTS / QUERIES	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.		
349.	VI / A	V	8 OF 26	5.01.00	The location of new Wet Chimney shall be near to Existing Chimney in the space provided clearing foundation interface. The design of Wet Chimney shall be done considering interface factor of existing chimney as determined by wind tunnel study. However, no design check or validation shall be done for existing chimney/structures/buildings. Kindly confirm.	It is confirmed that no design check or validation shall be done by the bidder for existing chimney(s).

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Sl. No.	Vol No	Clause No.	Page No.	Issues	Comments / Clarifications	NTPC reply
350.	Sec-VI Part-D ,ECC	Clause no. 28.04.00	Page no. 12	Site laboratory for Civil Work	Bidder through its civil work sub-contractors will set up a temporary field quality Lab to conduct normal civil work tests at site. However, customer to allow bidder/it's subcontractors to take back those field quality lab equipment after completion of work at site. Please confirm.	We understand that after completion of work at site, contractor may be allowed to take back their lab equipments.

SL.	ENQUIRY SPECIFICATION	SPECIFICATION REQUIRE-	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS

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SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
384.	VI-PART-B	VI-D CIVIL WORKS	24 of 69	6.08.00	Access to RCC roof of Gypsum dewatering building, FGD Control room building, MCC building, ball Mill building shall be through RCC staircase and roof access to all other buildings all shall be through cage ladder as per requirement	It is proposed to provide steel staircases for access to operating floors of all buildings except FGD Control room/MCC building. RCC staircase will be provided for FGD Control room/MCC building. Cage ladder may be allowed for access to roofs of all buildings with roof sheeting. Kindly accept	Bidder shall comply with technical specification requirement.
385.	VI-PART-B	VI-D CIVIL WORKS	-	-	Ball Mill Building:	Type of construction of Ball Mill building is not mentioned in the technical specification. Bidder proposes to use structural steel building with roof sheeting and side cladding (sheeting and cladding with permanently colour coated sheeting). Kindly confirm.	Type of building structure (Steel/RCC) and cladding system shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints if any). However, roof shall be of RCC as per technical specification requirement.

TENDER NO PSER-SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)
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TENDER NO PSER:SCT:NBN-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
386.	VI-PART-B	VI-D CIVIL WORKS	-	-	Gypsum building: dewatering	Type of construction of Gypsum Dewatering building is not mentioned in the technical specification. Bidder proposes to use structural steel building with roof sheeting and side cladding (sheeting and cladding with permanently colour coated sheeting). Floor of Vacuum belt filter will be RCC over metal deck sheeting. Kindly confirm.	Bidder shall comply with technical specification requirement.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL)
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TENDER NO PSER:SCT:NBH-C2059:20

SL. NO	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATIONS	NTPC CLARIFICATIONS
	SEC/ PART	SUBSEC.	PAGE NO.	CLAUSE NO.			
387.	VI-PART-B	VI-D CIVIL WORKS	-	-	Recirculation & Oxidation Blower house:	Type of construction of the building to house recirculation pumps and oxidation blowers is not mentioned in the technical specification. Bidder proposes to use structural steel building with roof sheeting and side cladding (sheeting and cladding with permanently colour coated sheeting). Kindly confirm.	Type of building structure (Steel/RCC) and cladding system shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any). However, roof shall be of RCC as per technical specification requirement.

TENDER NO PSER:SCT:NBH-C2059:20

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S. No	Clause No	Page No.	Description of Bid Document	Bidders Queries/Suggestions	NTPC Clarifications
					iii) Bidder's query is not clear. Bidder shall comply with the specification requirement.
425.	Section VI/Part B/SubSection-IV-CIVIL			Please provide the geotechnical investigation report and the trial pile report for the main power building.	Bidder to refer Project information chapter. Bidder to refer necessary amendment in this regard.
426.	Section VI/Part A/Sub Section III Scope of Supply and Services			Please confirm the scope of supply for water supply and drainage? Is sanitary ware not within the scope of supply?	Specification requirement is clear. Bidder shall comply with the specification requirements.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
538.	Section-VI (TS) Part-B Sub-section-II E15 Station Lighting	4.00.00.10 (I)	8 of 16	Lighting Panels shall be of following types:	Please clarify the purpose of 3kVA transformer located inside of LP-3 type lighting panel itself.	LP-3 shall be used for feeding of RC receptacle as mentioned in technical specification. Kindly refer clause no:- 4.00.00.10.h
539.	Section-VI (TS) Part-B Sub-section-II E15 Station Lighting	Annexure - A.	15 of 16	Annexure - A.	Please clarify average illumination Lux levels (or ratio (%) of fixture) to be adopted in certain area where Emergency AC, Normal DC, Emergency DC Lightings are installed.	Refer to Annexure-B in Station Lighting chapter. Amendment-1 Issued
540.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	3.14.00	10 of 69	Single flue or multiple flue chimneys to be provided	Bidder suggests that this chimney might not be necessary. Please confirm.	Bidder shall comply to the requirements of technical specification.
541.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	12.00.00 (Roads)	30 of 69	Concrete pavement for roads shall be min. 250mm thick slab	Please clarify which particular specification about roads needs to be followed.	Query is not dear

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
542.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	12.00.00	31 of 69	Dry lean concrete shall be minimum M10 grade and concrete pavement slab shall be minimum M35 grade concrete.	Please clarify which particular specification about roads needs to be followed.	Query is not clear
543.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	21.00.00	41 of 69	RCC paving of min. 150mm thick with M25 grade concrete	Please clarify which particular specification about roads needs to be followed.	Query is not clear
544.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	29.02.00	48 of 69	Interconnecting walkway between various structures, buildings & facilities shall be finished with 22mm chequered concrete tiles	Please confirm - between which structures / buildings are interconnecting walkways required? Further, if the interconnecting walkways (if any) are steel structures, can we use steel chequered plate / gratings in place of chequered concrete tiles?	As the layout of FGD system is in Bidder's scope, ascertaining the requirement of Interconnecting walkway between various structures, buildings & facilities is in the scope of Bidder. For finishing schedule, Bidder shall comply with technical specification requirement.
545.	Section-VI (TS) Part-B Sub-Section	31.03.00	56 of 69	All steel surfaces should be provided with two component moisture curing zinc silicate primer	What separate paint is required other than the primer, intermediate & final coat already provided in the shop?	For steel sections and structures which are to be transported on sea, anti-corrosive paint before shipment shall be provided to take care of sea worthiness.

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Sl. No.	Section/Part/Chapter	Clause No.	Page No.	Bid Specification	Clarification sought by the bidder	NTPC CLARIFICATIONS
	IV-D Civil Works			coat, followed by polyamide curved epoxy (with MIO content) intermediate & aliphatic isocyanate curved acrylic final coat, all in shop	Please clarify.	
546.	Section-VI (TS) Part-B Sub-Section IV-D Civil Works	31.07.00	57 of 69	All steel sections & fabricated structures, which are required to be transported by sea, shall be provided with anti-corrosive paint before shipment to take care of sea worthiness	Same with above.	For steel sections and structures which are to be transported on sea, anti-corrosive paint before shipment shall be provided to take care of sea worthiness.
547.	Section-VI (TS) Part-E List of Tender Drawings	ELECTRICAL SINGLE LINE DIAGRAM FOR FGD PACKAGE	53 of 53	GENERAL NOTE 11. Panel being used for feeding of CHP	Bidder understands scope of supply for cabling from 11kV FGD TIE SWGR to 11/3.45kV Exiting CHP/AHP TR as below. Please confirm. - Power Cable: Supplied by FGD Supplier's - Cable raceway: Supplied by employer. (up to employer's trestle : Supplied by FGD Supplier's)	Refer amended tender SLD. -Bidder shall comply with technical specification requirement clause no: - 1.08.00.2.However bidder may visit the project in order to get itself acquainted with existing electrical of plant. GLP of respective plants has already been attached.

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Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
678.	SECTION – VI, PART-D	Erection Condition of contract	44.22.00	Hydra shall not be used for material transport	Bidder understanding is that Farna shall be used in place of Hydra.	Specification requirement is clear. Bidder shall comply with the specification requirements.
679.	SECTION – VI, PART-A	Scope of supply and Services	2.00.00 (10)	Providing all necessary fire fighting devices/ Equipment/Fire tender etc. required during the project execution.....	Bidder shall provide all fire fighting devices / Equipment during the entire Project Execution period for its scope of work. However Bidder requested Employer to provide the Fire Tender of the existing Plant during emergency if required	Bidders understanding/request is not correct.
680.	SECTION – VI, PART-B	SUB-SECTION- VI-D Civil Works	4.01.00	Drainage System	Bidder clarifies that Employers existing drain invert level shall be necessary to plan the RCC drain(in the scope of Bidder) on which water from the pit in FGD area shall be diverted. So Bidder request Employer furnish the above information.	Refer General Layout Plan. Road and drain drawing shall be provided after award.
681.	SECTION – VI, PART-A	SUB-SECTION- II-A2-Project Information- Lara-I 2X800 MW	Annexure-II	Borelog Data Sheet	The Location and Co-ordinates of various borelogs marked in the data sheet does not match with the location indicated in GLP.	Bidder may refer Clause No.7.00.02, as mentioned in Clause No. 7.00.02, the available borelog data is of vicinity to proposed structure and the

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BIDDING DOCUMENT NO.: CS-0011-109(1A)-2

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
860.	Section VI / Part A / Subsection III A5	3.01 .00	6 of 6	Gypsum shall be conveyed from the vacuum belt filter to the storage shed through a series of double stream conveyors and transfer points/junction towers.		
861.	Section VI / Part A / Sub Section III A1	3.00.00	2 of 9	The contractors scope shall include a common limestone grinding system for all the units and shall comprise of.....	Bidder understands that limestone handling system is in Bidder's scope. Kindly confirm.	Bidder's understanding is correct. Bidder to refer necessary amendment in this regard.
862.	Section VI / Part A / Subsection III A5	2.01.00	2 of 6	Limestone Handling Plant (LHP)		
863.	Section VI / Part A / Sub Section III D CIVIL WORKS	1.06.00	2 of 4	Uniform Finished Ground Level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing.	Bidder understands that filling / cutting of earth is in his scope in areas other than the main absorber. Kindly confirm.	Refer amendment issued separately.
864.	Section VI / Part A / Sub Section IV Terminal points and Exclusions	1.10.00	2 of 3	Outlet of gypsum storage silo/ shed	As per section VI, Part-A, Sub Section III - A5, Page 2 of 6, "Gypsum to be conveyed to gypsum storage Shed". Bidder shall consider only a storage shed for gypsum. Kindly confirm.	Confirmed.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
865.	Section VI / Part B / Sub Section IV-D Civil Works	3.07.00	8 of 69	Gypsum storage shed The gypsum storage shed shall be RCC framed structure with structural steel work shed with permanent colour coated profile steel sheet roof and side cladding...	Bidder requests for an option for the gypsum storage shed to be made of structural steel superstructure with Structural columns and sheeting. Kindly confirm.	Bidder shall follow technical specifications in this regard. Bidder shall also refer s.no.1 of amendment no 1 in this regard.
866.	Project information			Wind and seismic codes	Kindly confirm the following: 1) Bidder would like to consider IS 875 (Part-3):2015 for wind loading 2) Bidder would like to consider IS 1893 (Part 2):2016, "General provisions and buildings" for buildings and IS 1893 (Part-4) : 2015 "Industrial structures including stack - like structures" for stacks along with site specific spectra provided.	Bidder shall comply to site specific "criteria for wind and earthquake resistant design of structures" specified in "Project information" section of technical specification.
867.	Section VI / Part A / Sub Section II-A6 Project information, Solapur (2X660MW)	7.08.00	19 of 31	Employer has carried out geotechnical investigation in vicinity to the proposed area. Logs of representative boreholes for bidder's information in the vicinity of proposed area are enclosed with	Kindly furnish the annexure mentioned in the clause referred in the specification.	Bidder to refer amendment

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
872.	Section VI, Part B, Subsection IV-D - Civil works	39.03.00	66 of 69	Fly ash based Portland poz-zolona cement conforming to IS:1489, Part I shall preferably be used.	a) OPC cement mixed with fly ash can also be used for FGD structures except for Chimney. Owner to please confirm. b) Clause 39.03.00 is not applicable for Chimney shell. For Chimney shell, bidder have to use OPC cement only. Please confirm bidder's understanding.	a. Bidder shall comply with Technical specification requirement. b. For chimney shell, only OPC cement shall be used.
873.	General				Only two borelogs are furnished in the tender document for Barh project. Bidder request Owner to furnish additional bore holes as the FGD structures are located in a scattered manner within the existing units.	Bidder may refer Clause No.7.00.02, as mentioned in Clause No. 7.00.02, the available borelog data is of vicinity to proposed structure and the same has already been furnished in the tender document. Detailed Geotechnical Investigation shall be carried out by contractor.

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CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
875.	Section VI, Part A, Subsection IIID, Page 1 of 4	2.00.00	2 of 4	Bidder shall provide permanent access to all facilities/structures from the near-by existing roads of the Owner. Roads shall be in concrete (M 35) as per IRC.... Width of all such roads shall be 7.5 M concrete pavement.	Bidder requests NTPC to provide width requirement for shoulders? Also whether shoulders are required on both sides of road?	Refer amendment issued separately.
	Section VI, Part B, SubSection IV-D	12.00.00	30 of 69	The road construction including its shoulders, base, sub base and concrete pavement shall be as per IRC standard.		
876.	Section VI, Part A, IIA-10	7.03.00, d)	12 of 30	Pile diameter - 600 mm	NTPC Barh - Being an EPC bid, Owner to allow bidder to select pile diameter, length and capacities as per detailed soil investigation and test pile result.	Bidder shall comply the provisions of technical specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
879.	Section VI, Part B, Subsection IV-D - Civil worksSection VI, Part A, Subsection II - A11Section VI, Part A, Subsection II - 8A	39.03.003 9.04.007.0 8.00 g)Annexure-III (New Nabina-gar-I)	66 of 6966 of 6922 of 2921 of 31	Fly ash based Portland poz-zolona cement conforming to IS:1489, Part I shall preferably be used....or Fe500D, and conforming to other requirements of IS:1786Chemicals in ground water as observed during investigation are:.....Cement type - As specified elsewhere in the specification.g)Special requirements:Chemicals in ground water as observed during investigation are:.....In view of the above, the following shall be adopted for all foundations and substructures,	BRBCL and Nabinagar - No separate specification for cement type and reinforcement steel are mentioned in the relevant subsection. Hence bidder shall follow clause no. 39.03.00 for Cement and clause no.39.04.00 (Subsection IV-D, Section VI, Part B) for Reinforcement steel for projects, wherever special requirements are not mentioned. Please confirm bidder's understanding.	Bidders's understanding is correct.
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CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
880.	Section VI, Part B, Sub Section - I- M1 Section VI, Part B, Subsection-IV-D - Civil works	3.00.00 3.14.04	5 of 51 13 of 69	The entire flue gas system, flue gas ducts, absorber etc. shall be designed to meet the following conditions: Criteria of flue gas exit velocity for sizing the flue liner material shall be specified elsewhere in the specification.	Owner to specify the below mentioned details for design of 150 m high Chimney: a) Maximum Flue gas exit velocity b) Pressure at Chimney Inlet to be considered by bidder for design. The above mentioned details have not been furnished in tender specification.	a) Specification requirement is clear under the referred cl.no. . Bidder shall comply with the specification requirements. b) To be optimized by the bidder based on its system design and selection.
881.	Errata 1 to Section VI, Part A, Subsection II - A8	Annexure B	9 of 31	a) The basic wind speed "Vb" at ten	NTPC 3x660MW/Nabinagar - The basic wind speed Vb at ten meters above the mean ground level may please be specified.	The basic wind speed "Vb" at 10m height above the mean ground level for "NABINAGAR-I 3X660 MW" project shall be 47 metres/second. Also refer Amendment issued separately in this regard.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
882.	Section VI, Part A, Subsection IIA6-4		Equipment layout plan at El 0.00 m	NTPC Solapur - All elevations indicated in the drawing are wrt TG building ground floor elevation as (+/-)0.00 which corresponds to RL(+) 416.5	NTPC Solapur - Bidder understands that FGL for the plant is RL 461 m whereas TG ground floor level i.e. FFL is RL 461.50. Please confirm.	Bidder's understanding is correct.
883.	Section VI, Part A, Subsection IIA6-4	7.00.01	9 of 31	The corresponding bore logs are enclosed at annexure-IV.	NTPC Solapur - Owner to furnish soil investigation report for the vicinity area as the same are not available with tender document.	Bidder to refer amendment.
884.	Section VI, Part B, Sub Section - IV-D	12.00.00	31 of 69	Concrete pavement of the road shall be done with fully mechanized paver fitted with electronic sensors for construction technique.	As quantum of road work is very less and considering lack of space within the existing units, bidder understands that deployment of mechanical pavers are not mandatory. Owner to kindly confirm bidder's understanding.	Method(s) as per IRC may be followed.
885.	Section VI, Part B, Sub Section IV D, Civil works	10.00.00	26 of 69	Site LevellingSite levelling of gypsum area, lime storage area, gypsum dewatering area, truck hopper and associated areas to be levelled in one block.	Bidder is free to decide FGL based on existing NGL in order to optimize cutting and filling quantities. Owner to please confirm.	Site levelling shall be done by Owner as per the levels specified in GLP in tender document. Only site clearance and minor grading is in bidder's

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BIDDING DOCUMENT NO.: CS-0011-109(1A)-2

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
						scope.
886.	Section VI, Part A, Subsection II-A4	Annexure III	19 of 30	Employer has carried out geotechnical investigation in vicinity to the proposed area. Logs of representative boreholes for bidder's information in the vicinity of proposed area are enclosed with this Annexure	Geotechnical investigation for Dalipalli Stage-I, 2x800 MW project is not attached along with the tender document. Owner is requested to furnish the same.	Refer amendment issued separately
887.	Section VI, Part B, Sub Section - IV-D	19.00.00	39 of 69	All steel structures shall be fabricated in factory, transported and erected at site.	Bidder understands that fabrication of silo/hoppers /tanks /absorber shell,etc. can either be fabricated at factory or fabricated at site. In case of site or shop fabrication, field connection will be welded. Please confirm bidder's understanding.	Considering the large dimensions of the said equipment, Bidder's understanding is correct.

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Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
913.	Section VI, Part B, Sub Section IV D, Civil works	17.21.00 b)	37 of 69	Waterproofing treatment shall be provided for liquid retaining/carrying structures and basement type structures (requiring dry working condition). Truck hopper - Chemical injection grouting for inner faces. Polymer modified cementitious coating on earth side face as per the following:	Bidder understands that clause no. 17.21.00 of subsection IV-D Civil works, is not applicable for truck hopper and limestone hopper. Please confirm.	Bidder's understanding is correct.
914.	Section VI, Part B, Sub Section IV D, Civil works	3.01.00	3 of 69	The FGD system shall have an independent absorber for each unit, common limestone milling systems and common gypsum dewatering system for each Lot 1 A Project.	The space available for installation of FGDs at most sites is very limited. In such cases, it shall be beneficial to optimise the available space when offered technology is capable to do so with equal effectiveness. Bidder offers Jet Bubbling Technology, which has excellent flexible operability even at shutdown ratios of 15%. We request NTPC to accept option of offering combined absorber for multiple units. Our collaborator has proven references of such common absorbers installed for multiple units operating successfully globally.	Specification requirement is clear. Bidder shall comply with the specification requirements.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No	Section / Part / Chapter / Volume	Clause No.	Page No.	Bid specification	Bidder's Query	NTPC's Clarification
916.	SECTION-VI, PART-B/ SUB SECTION-1-M3/COMPRESSED AIR SYSTEM	2.02.02	1 of 7	The rotor and shaft shall be of single piece construction, made of forged steel (AISI C1141 or equivalent). The stator (casing) shall be of Cast-Iron (IS-210 grade) Construction with integral jacket cooling. The rotors shall be dynamically balanced to reduce vibration.	Bidder would like to clarify that, material of construction of compressors shall be as per manufacturer' s standard design which is proven in the industry. Owner is requested to accept the same.	Bidder shall comply with specification requirement. However, any superior material may be accepted as per manufacturer proven design practice
917.	SECTION-VI, PART-B/ SUB SECTION-1-M3/COMPRESSED AIR SYSTEM	4.11.00	2 of 7	For the instrument air compressors offered with "Heat of compression" type air drying plants, the after coolers shall be provided at downstream of Air Drying Plant.	Bidder would like to clarify that, after cooler shall be integral part of compressor instead of installing the seperate aftercooler downstream of air dryer and the hot air required for HOC type dryer regeneration shall be taken from last stage of compressor, before after cooler as per prevailing industry practice. Owner is requested to accept the same.	Bidders query is not clear. In HOC type Air dryer, to reduce the discharge temperature at dryer outlet to 45 deg celcius, after cooler shall be provided at downstream of air dryer as per specification requirement.

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No.	Section No.	Clause No.	Bid Specification Stipulation	Bidder's Query / Stipulation	NTPC Clarifications
1161.	Part-A-Sub Section-II-A6	Clause no.7.08- Page no.19	Foundation System and Geotechnical Data- Type of Foundation system to be adopted- Open Foundation system.	The foundation design shall be based on final recommendations of geotechnical investigation report approved by Client during execution. Provision shall be made for appropriate compensation if any major variation in the soil data/ sub-soil conditions if identified.	Bidder may refer Cl. No. 7.00.03. If bidder feels, data provided is not adequate, he may carry out geotechnical investigation for bidding purpose. Further, Bidder shall comply the provisions of Technical Specification.
1162.	Sub-Section-IVD -CIVIL WORKS	Clause no.12.00	RCC Roads & RCC Drains	Bidder understands that only approach roads along with drains on both sides shall be provided from the new structures of the proposed FGD. The main plant roads and drains shall be in the scope of the client. Please confirm.	Refer Scope of work. Refer clause 2.00.00 Section-VI, Part-A of technical specification.
1163.	Sub-Section-IVD -CIVIL WORKS	Clause no.13.00	Gate Along Boundary Wall	Bidder understands that any works for construction of gate along boundary wall is excluded from the bidders scope of work.	Refer Scope of work. Refer clause 2.00.00 Section-VI, Part-A of technical specification.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No.	Section No.	Clause No.	Bid Specification Stipulation	Bidder's Query / Stipulation	NTPC Clarifications
1164.	Sub-Section- IVD -CIVIL WORKS	Clause no.4.01	Contractors scope shall include construction of necessary culverts below railway lines/ roads as per the railway/IRC standards and shall take approvals of railway culverts from the concerned railway authorities.	Bidder has considered RCC hume pipe culverts only below the approach roads in the scope of works for this package. Bidder has excluded the construction of culverts below railway lines and taking their approvals from necessary railway authorities. Bidder request client to kindly confirm.	Bidder shall comply with technical specification requirement.
1165.	Sub-Section- IVD -CIVIL WORKS	Clause no.14.00	The Storm Water drainage for any area under consideration shall be taken in to account the finished grade levels of the area.	Bidder has considered only the drains along the approach roads and garland drains around the proposed structures. These drains shall be connected to the nearest main plant drains with proper slopes. Please confirm.	Bidder's understanding is correct.
1166.	Sub-Section- IVD -CIVIL WORKS	Clause no.25.02	Excavations in hard rock shall be carried by Blasting if required. The contractor shall obtain license from the competent authorities for undertaking blasting works.	Bidder request client to take necessary statutory permissions required for Blasting from the concern authorities. Bidder has excluded these from their scope of work.	Bidder shall comply with technical specification requirement.
1167.	Sub Section I-M1	Clause 5.06.06	Mist eliminator	Whether bidder can propose roof type ME with PP material	Bidder can propose roof type Mist Eliminators with the material specified in the Technical Specification.

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



S.No	Vol No/Clause No	Page No.	Description of Bid Document	Queries/Suggestions	NTPC Clarifications
1	SECTION -VI TECHNICAL SPECIFICATION, Clause: 3.14.03	1	The wind shield shall be designed for vertical loading, cross wind loading, seismic loading, circumferential wind loading, thermal gradients etc. The load calculation and load combinations shall be as detailed in IS 4998 (Part 1) : 1992. The wind shield shall be analysed for cases with and without flue liner loads.	NTPC to clarify wind shield design shall be performed as per IS 4998 (Part 1) : 1992 or IS 4998 (Part 1) : 2015.	Bidder shall comply to the requirements of technical specification.
2	SECTION -VI TECHNICAL SPECIFICATION, Clause: 3.14.03	2	The effect of the openings/cut-outs in the chimney shell shall be duly considered in the design of the windshield. The minimum thickness of shell shall not be less than 500mm.	NTPC to confirm the minimum thickness of shell shall be as per IS 4998(Part-1) or 500mm.	Bidder shall comply to the requirements of technical specification.
3	SECTION -VI TECHNICAL SPECIFICATION, Clause: 3.14.01	10		As there is no clarity regarding mini shell above roof level, it is proposed to extend the steel flu can above chimney roof with 2 mm thick Titanium / C-276 sheet over insulation as per clause 3.02.07 of SUB-SECTION-I-M1(Part-B) on external surface of the steel flu extended above roof. No RCC mini shell considered. NTPC to confirm.	Flue liner shall be provided as per the requirements of technical Specification. There is no specific requirement of RCC mini-shell.

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No.	Section No.	Clause No.	Bid Specification Stipulation	Bidder's Query / Stipulation	NTPC Clarifications
1170.	Sub-Section-IVD -CIVIL WORKS	Clause no.12.00	RCC Roads & RCC Drains	Bidder understands that only approach roads along with drains on both sides shall be provided from the new structures of the proposed FGD. The main plant roads and drains shall be in the scope of the client. Please confirm.	Refer Scope of work. Refer clause 2.00.00 Section-VI, Part-A of technical specification
1171.	Sub-Section-IVD -CIVIL WORKS	Clause no.13.00	Gate Along Boundary Wall	Bidder understands that any works for construction of gate along boundary wall is excluded from the bidders scope of work.	Refer Scope of work. Refer clause 2.00.00 Section-VI, Part-A of technical specification.
1172.	Sub-Section-IVD -CIVIL WORKS	Clause no.4.01	Contractors scope shall include construction of necessary culverts below railway lines/ roads as per the railway/IRC standards and shall take approvals of railway culverts from the concerned railway authorities.	Bidder has considered RCC hume pipe culverts only below the approach roads in the scope of works for this package. Bidder has excluded the construction of culverts below railway lines and taking their approvals from necessary railway authorities. Bidder request client to kindly confirm.	Bidder shall comply with technical specification requirement.
1173.	Sub-Section-IVD -CIVIL WORKS	Clause no.14.00	The Storm Water drainage for any area under consideration shall be taken in to account the finished grade levels of the area.	Bidder has considered only the drains along the approach roads and garland drains around the proposed structures. These drains shall be connected to the nearest main plant drains with proper slopes. Please confirm.	Bidder's understanding is correct.

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sr. No.	Section No.	Clause No.	Bid Specification Stipulation	Bidder's Query / Stipulation	NTPC Clarifications
1174.	Sub-Section-IVD -CIVIL WORKS	Clause no.25.02	Excavations in hard rock shall be carried by Blasting if required. The contractor shall obtain license from the competent authorities for undertaking blasting works.	Bidder request client to take necessary statutory permissions required for Blasting from the concerned authorities. Bidder has excluded these from their scope of work.	Bidder shall comply the provisions of Technical Specification.
1175.	Sub Section I-M1	Clause 5.06.06	Mist eliminator	Whether bidder can propose roof type ME with PP material	Bidder shall comply with the requirements of Technical Specifications.
1176.	Sub Section I-M1	Clause 5.03.02	Oxidation Blower	The stoichiometric ratio of 2.5 was mostly used in the past for grid type of oxidation, now a day with new spargers, lower SR typically below 2 are in use, can we consider lower SR. Also whether we can offer 3 blowers (2W+1S) common for two units	Bidder shall comply with the requirements of Technical Specifications.
1177.	Extension			As explained during pre-bid meeting, requirement of site visits and overall complex nature of project, we request the bid submission date extension up to 17.10.2017	Not a technical query.

S. No.	Section	Clause No	Page No.	Statement of Deviation/Part/Chapter	Variations / Exceptions	NTPC Clarifications
B.	TECHNICAL DEVIATION					

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
1210.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar STPP-I, 3x660 MW)	GLP (Drawing No. 0370-999-POC-F-001, Rev-9)	2 nos. Belt conveyor (2A & 2B) traveling from PH-1 to Crusher House I	Bidder request employer to furnish the following detail of Conveyor 2A & 2B between PH-1 to Crusher House I: - Structural ArranBID-DERment Drawings of Galary & Supports - GA of Conveyors - Capacity of existing coal conveyors etc.	Noted. Detailed drawings of existing facilities shall be provided with the successful bidder.
1211.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar STPP-I, 3x660 MW)	GLP (Drawing No. 0370-999-POC-F-001, Rev-9)	Pipe/Cable trusses traveling near FGD area	Bidder request Employer to furnish the Foundation drawing of Cable/pipe Trestles coming near ID Fan outlet duct entering to stack and near FGD area.	Bidder to refer Table 6 of Sub Section- II-A8 PROJECT INFORMATION (NABINAGAR STPP-I 3 X660MW) Section –VI, Part-A for pipe/cable trestle drawings.
1212.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar STPP-I, 3x660 MW)	GLP (Drawing No. 0370-999-POC-F-001, Rev-9)	Trestles shown near to "Space for FGD"	Bidder wish to clarify that during their site visit, they have seen that the Trestles near "Space for FGD" is under construction, so Bidder understand that Employer will provide space in the exist-	Stipulations, as given under Clause 14.00.00 Sub Section- III-A1 Section –VI, Part-A, shall be complied with w.r.t trestles. Bidder shall comply with technical specification re-

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CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
1213.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar STPP-I, 3x660 MW)		Space For FGD	During Bidders site visit, it was observed that there are some Contractors site office/store is already exist in the Space marked for FGD. So Employer is requested to furnish the clear levelled land for the spaces marked for FGD.	requirement clause no: - 1.08.00.2 Sub Section- III-B, Section –VI, Part-A.
1214.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar STPP-I, 3x660 MW)	Geotechnical Investigation Scheme(Clause- 7.08.00- page19 of 31)	Soil Data and Foundation System	Bidder request Owner to provide the soil resistivity values for the FGD designated area.	Bidder may refer necessary Amendment.
1215.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar STPP-I, 3x660 MW)	GLP (Drawing No. 0370-999-POC-F-001, Rev-9)	Storage/Laydown area/Area for dumping of excavated material	During site visit, it has been observed that no area has been earmarked for laydown/storage/ excavated material dumping other than the areas identified for FGD. Bidder	Bidder to refer the revised GLP in issued amendments.

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CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
1216.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar STPP-I, 3x660 MW)	GLP (Drawing No. 0370-999-POC-F-001, Rev-9)	Underground substructures, sewer pipes, water pipes, cables etc around the FGD	request Owner to please earmark areas at site for laydown/storage/ excavated material dumping. Bidder request Owner to please provide the drawings for underground pipes, cables, amenities, utilities etc around the FGD area .	Same will be discussed with the successful bidder during the detail engg. stage.
1217.	SECTION – VI, PART-A	SUB-SECTION-II-A8(Project Information- Nabinagar TPP, 4x250 MW)	GLP (Drawing No. 0270-999-POC-F-001, Rev-6)	Trestles shown near to "Space for FGD"	Bidder wish to clarify that during their site visit, they have seen that the Trestles near "Space for FGD" is under construction, so Bidder understand that Employer will provide space in the existing/under construction trestles to install bidders supplied cables & pipes for FGD.	Stipulations, as given under Clause 14.00.00 Sub Section- III-A1 Section –VI, Part-A, shall be complied with w.r.t trestles. Bidder shall comply with technical specification requirement clause no: - 1.08.00.2 Sub Section- III-B, Section –VI, Part-A.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
					ID Fan outlet ducts along with associated foundation drawings etc. enabling Bidder to decide the duct layout from tapping point to FGD area	INFORMATION (NABINAGAR TPP) Section –VI Part-A, being issued separately, for pipe/cable trestle drawings. Requested drawings as ID Fan outlet ducts foundation drawings will be discussed with the successful bidder during the detail engg. stage.
1222.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar TPP, 4x250 MW)	Geotechnical Investigation Scheme(Clause- 7.08.00- page 20 of 29)	Soil Data and Foundation System	Bidder request Owner to provide the soil resistivity values for the FGD designated area.	Bidder to refer necessary amendment in this regard.
1223.	SECTION – VI, PART-A	SUB-SECTION-II-A8 (Project Information- Nabinagar TPP, 4x250 MW)	GLP (Drawing No. 0270-999-POC-F-001, Rev-6)	Storage/Laydown area/Area for dumping of excavated material	During site visit, it has been observed that no area has been earmarked for laydown/storage/ excavated material dumping other than the areas identified for FGD. Bidder request Owner to please earmark areas at site for	Bidder to refer the revised GLP in issued amendments.

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CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
1224.	SECTION – VI, PART-A	SUB-SECTION-II-A8(Project Information-Nabinagar TPP, 4x250 MW)	GLP (Drawing No. 0270-999-POC-F-001, Rev-6)	Underground structures, sewer pipes, water pipes, cables etc around the FGD	Bidder request Owner to please provide the drawings for underground pipes, cables, amenities, utilities etc around the FGD area .	Same will be discussed with the successful bidder during the detail engg. stage.
1225.	SECTION – VI, PART-E	Tender Drawing List-Electrical Single Line Diagram of FGD Package	Drawing No. 0011-109-POE-J-001A-E, Rev-A	11 KV KV HT SWGR Panel	Bidder wish to clarify that during their site visit, they have found only 6.6 KV HT SWGR at the main TG building instead of 11 KV. Bidder request Employer to furnish the revised SLD for BRBCL site.	Refer amended Tender SLD.

CLARIFICATION No.01 (TECHNICAL)

Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
1252.	SECTION – VI, PART-A	SUB-SECTION-II-A1 (Project Information- Kudgi Super Thermal Power Project-3x800 MW)	GLP (Drawing No. 9571-999-POC-F-001, Rev-5D0)	Storage/Laydown area/Area for dumping of excavated material	During site visit, it has been observed that no area has been earmarked for laydown/storage/ excavated material dumping other than the areas identified for FGD. Bidder request Owner to please earmark areas at site for laydown/storage/ excavated material dumping.	Bidder to refer the revised GLP in issued amendments.
1253.	SECTION – VI, PART-A	SUB-SECTION-II-A1 (Project Information- Kudgi Super Thermal Power Project-3x800 MW)	GLP (Drawing No. 9571-999-POC-F-001, Rev-5D0)	Underground substructures, sewer pipes, water pipes, cables etc around the FGD	Bidder request Owner to please provide the drawings for underground pipes, cables, amenities, utilities etc around the FGD area .	Same will be discussed with the successful bidder during the detail engg. stage.
1254.	SECTION – VI, PART-A	Subsection-III-D Civil	1.06.00	Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in tender drawing	Bidder understand that Uniformed Finished ground level will be arranged by Employer (at NTP) for the area's allocated for FGD (Space for FGD mentioned in the layout drawing) Employer is requested to	Site levelling shall be done by Owner as per the levels specified in GLP in tender document. Only site clearance and minor grading is in bidder's scope.

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CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects



TENDER NO PSER:SCT:NBN-C2059:20

Sl. No.	Specification Reference			Employer (NTPC) Specification	Bidder Requested Clarification	NTPC Clarifications
	Part	Sub-section	Clause no.			
					confirm on Bidders understanding.	
1255.	GENERAL POINT			Employers Hostels/guest house	Employer is requested to allow their existing hostels/guest house on chargeable basis.	This may not be possible, however during the execution stage the same can be discussed with our site.
1256.	SECTION – VI, PART-B	Subsection-IV-D Civil Works	39.00.00	Sand aggregate for Construction		Query is not clear.
1257.	GENERAL POINT			Topographical Survey drawing	Bidder request topographical survey drawing in Autocad format of all proposed FGD site..	Bidder to refer necessary amendment in this regard.
1258.	GENERAL POINT			Area Drainage Study report	Bidder request Owner to furnish Area Drainage Study report for planning the drainage in the area earmarked for FGD facilities of all proposed site.	Bidder to refer the revised GLP in issued amendments.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects

TENDER NO PSER:SCT:NBN-C2059:20

Sl.No	Section /Part / Chapter	Clause No.	Page No.	As per RFQ	Pre Bid Queries	NTPC Clarifications
	FGD SYSTEMS					
1625.	Section-VI Part-B SUB-SECTION-IV-D CIVIL WORKS	6.08.00	24 of 69	Access to RCC roof of Gypsum dewatering building, FGD Control room building, MCC building, Ball mill building shall be through RCC staircase, and roof access to all other buildings all shall be through cage ladder as per requirement.	Bidder understands that Gypsum Dewatering Building, FGD Control room, MCC building, Ball mill building, Slurry Recirculation pump house, Oxidation blower are RCC framed building with Brick walls. In addition No wall / Cladding shall be provided for areas where Blower, Slurry Recirculation Pumps, Dewatering equipment, Limestone Ball mill were located since these areas need maintenance access for the above equipments. However Electrical Control room, MCC room will be enclosed type with Brick walls. NTPC to confirm.	Bidder shall comply with technical specification requirement.
1626.	Section-VI Part-B Sub Sec-I-M1 (FGD)	7.07.07	28 of 51	All piping, valves & instrumentation upto the employer's terminal point shall be in the contractor's scope. Contractor shall provide the complete lime dosing system (in projects where	NTPC to furnish the size of Lime powder and inform whether the lime will be supplied in the form of bags or transported through truck.	Specification requirement is clear. Bidder shall comply with the specification requirements.

TENDER NO PSER:SCT:NBN-C2059:20

CLARIFICATION No.01 (TECHNICAL) Flue Gas Desulphurization (FGD) System Package for Lot 1A Projects

TENDER NO PSER:SCT:NBN-C2059:20

Sl.No	Section /Part / Chapter	Clause No.	Page No.	As per RFQ	Pre Bid Queries	NTPC Clarifications
	FGD SYSTEMS					
1695.	General (Project Information)	7.00.01	10 of 30	Geotechnical data and foundation system for the respective projects are enclosed at annexure- III	NTPC is requested to provide the detailed soil report near by chimney area for all projects.	Bidder to refer Foundation system and geotechnical data chapter furnished in Project information chapter.
1696.	COMMERCIAL					
1697.	Amendment no-1 to BDS (Sec-III)	ITB Clause no-26.4	1 of 1	LF Component (CIF price quoted in Schedule-1 plus CIF value of Import content of Ex-Works price included in Schedule-2) quoted by Bidder shall in no case be more than 30% of the total supply value quoted by bidder in price schedule-1 plus price schedule-2.	In view of limited suppliers for FGD equipment within India, it is presumed that these clauses are applicable for imported Bought Out items only, and imported raw materials does not fall under purview of 30% of the supply value. Therefore value of imported raw materials should be excluded and can be over and above this proposed limit of 30%. NTPC to clarify.	Bidder to refer clarifications being issued separately.
	Amendment no-1 to Technical Specification (Section-VI)	Sl.no-1	1 of 1	Government of India has launched " Make in India" initiative to transform India into a global Design and manufacturing hub. Accordingly, to promote manufacturing within India, the import content in flue gas Desulphurisation (FGD) system package has been restricted		

TENDER NO PSER:SCT:NBN-C2059:20

**Lot1A Flue Gas Desulfurization Package
Clarification No.04 (Technical)**

TENDER NO PSER:SCT:NBN-C2059:20

TENDER NO PSER:SCT:NBN-C2059:20

S.No.	Section/Part	Clause No.	Page No	Clause	Clarification	NTPC's Reply
51	CS-001.1-109(1A)-2-AMDT-05(T)	46	17 of 60	Single-flue chimney(s) shall be provided, <u>except for Tanda TPP (2X660MW) and Meila TPP (2X660MW) where twin-flue Chimney shall be provided.</u> Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point for single flue chimney shall be minimum 150 meters above the plant grade level and for twin flue chimney flue gas emission point shall be minimum 220m above the plant grade level.	Bidder understands that single flue chimney is also acceptable where twin flue chimney is mentioned. NTPC to Confirm.	Bidders understanding is correct.
52	CS-001.1-109(1A)-2-AMDT-05(T)	123	49 of 60	In order to optimise power consumption of FGD system at part load operation, Bidder to provide atleast one slurry recirculation pump preferably lower level with Variable Frequency Drive (VFD).	Bidder understands that gearbox is not required to be provided for the recirculation pump with variable frequency drive. NTPC to confirm.	Bidder may decide for gearbox in case recirculation pump is with variable frequency drive.
53	CS-001.1-109(1A)-2-AMDT-05(T)	123	49 of 60	In order to optimise power consumption of FGD system at part load operation, Bidder to provide atleast one slurry recirculation pump preferably lower level with Variable Frequency Drive (VFD).	<u>NTPC to advise for the following:</u> For Nabhinagar-4x 250MW unit the Motor rating for SRC (Slurry Recirculation Pumps) pumps will be approx 550 KW and as per latest amendment bottom level of pump motor will be with VFD of 690 V as per VFD specification, and all other remaining level motors will be with 3 Phase 6.6 KV AC motor as per original tender specification, which makes different voltage levels for different levels of SRC pumps motor (i.e Bottom level SRC pump motor with 690V LT and other level motors with 6.6 KV HT). Since the voltage levels for SRC pump motors are different, this will violate the NTPC specification of (As per Clause no-5.01.00 (ii) of Sub Section-HM1 of Section-VI) <u>All slurry recirculation pumps including motors shall be of the same size and type.</u>	All slurry recirculation pumps including motors shall be of the same size and type except for VFD driven SRC pump-motor set.
54	CS-001.1-109(1A)-2-AMDT-05(T)	Electrical Annexure-E2	Clause no- 3.03.00	The voltage level for the VFD output to be fed to motor shall be as follows:- 1. Upto 400 kW : 415V/690V, Low Voltage, Three Phase AC 2. <u>Above 400kW and upto 700 KW : 690V, Low Voltage, Three Phase AC</u> 3. Above 700KW : Medium Voltage		
55	CS-001.1-109(1A)-2-AMDT-05(T)	142 (c)	54 of 60	2x100% electric driven, single stage, integrally geared, single or dual vane centrifugal type / <u>positive displacement (helical lobe) type with VFD drive.</u> oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber reaction tank.	NTPC to clarify whether VFD is required only for Positive Displacement type blowers or both Positive Displacement Blowers and Centrifugal type blowers.	VFD for positive displacement (helical lobe) type oxidation blower is mandatory, however, for centrifugal type it is optional.

Lot1A Flue Gas Desulfurization Package
Clarification No.04 (Technical)

S.No.	Section/Part	Clause No.	Page No	Clause	Clarification	NTPC's Reply
79	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 90	Page 32/60	Piping for normal , piping for emergency-pump, other piping, fittings, supports, valves and specialties.....and structural steel shed for housing various equipment of Equipment cooling water system	1) Bidder understands that bidder can place other pumps along with the ECW equipment under the same shed. 2) ECW shed shall be open on all four sides, only roof will be provided with sheeting. 3) So Ventilation will not be considered for this shed.	Ventilation is not required for shed. Further, shed is to be provided along with roof sheet as per specification requirement.
80	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 109	Page 42/60	Gypsum Dewatering System & FGD control room. Slurry recirculating pumps & Oxidation blowers shall be located in a shed provided with roof sheeting.		Ventilation is not required for shed. Further, shed is to be provided along with roof sheet as per specification requirement.
81	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 142 b	Page 58/60	As per Amendment: Bidder should provide the condensate collection system such that the condensate collected shall be routed to absorber by gravity..... common storage tank for the both the units of storage capacity of 5 m3/hr of stack condensate of both the stack shall....	1) Bidder understands the storage capacity shall be 5 m3 for the common tank (for 2 units). 2) Please confirm what will be the capacity of the tank for 3rd unit (in case of three units) shall be.	Capacity shall be same for two/three units. Min 5m3/hr.
82	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 18	7 OF 60	Gypsum Dewatering system & FGD common control room & containerised room (portable cabin) for analysers. The buildings must be complete.....	Bidder proposes to use combined ball mill and dewatering building in plants where space/layout is a challenge. Bidder requests employer to confirm the same.	We have already provided sufficient space and space challenge is very subjective statement hence bidder is requested to comply with specification requirement.
83	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 19 (b)	8 of 60	Control and monitoring of air conditioning and ventilation system shall be done from FGD control system.	Bidder wish to clarify that Start, stop control and important parameter monitoring shall be done from FGD control system.	Bidder's understanding is correct.
84	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 19 (c)	8 of 60	Control and monitoring of air conditioning and ventilation system shall be done from FGD control system.	Bidder wish to clarify that Start, stop control and important parameter monitoring shall be done from FGD control system.	Bidder's understanding is correct.
85	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 23	9 of 60	Interplant cabling Cables crossing Railway line (if applicable) shall be laid underground through nearest culvert. Necessary statutory clearance if required shall be taken by Bidder.	Bidder would like to use same philosophy for the pipes crossing railway line. Hence bidder requests employer to allow use of existing nearest culvert for slurry/water pipe lines also.	Bidder's request may be consider only in case there is sufficient space available and no safety issue. At this point of time it can not be confirmed. In view of this bidder to consider scope as per the specification requirement.
86	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 42	16 of 60	Single-flue chimney(s) shall be provided, except for Tanda TPP (2X660MW) and Meja TPP (2X660MW) where twin-flue Chimney shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point for single flue chimney shall be minimum 150 meters above the plant grade level and for twin flue chimney the gas emission point shall be minimum 220m above the plant grade level.	As per IS:1893 (Part 4):2015, Bidder will carry out this analysis for verification of mechanism, only for category-1 structure (If any).	For Industrial structures, method of structural analysis (for seismic design) may be retained linear, for structure category 2 to 4.
87	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 46	16 of 60	The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres. For Barh-I (3X660MW) already existing 275m high chimneys shall be utilized with modifications as specified elsewhere in mechanical specification and hence, new chimney is not to be provided under FGD package. General Arrangement Drawing of already existing Chimneys at Barh-I are provided in Sub Section-II -A10, Part A, Section-VI for reference.	For Meja and Tanda bidder had proposed twin flue chimney in the past considering space constraint. In the latest amendment additional space have been provided by employer and it is now possible to go for single flue chimney's for each unit. Hence Bidder requests employer to allow flexibility of both options of single/twin flue chimney depending on layout.	Both options of single / twin flue chimney is allowed for Meja & Tanda.
88	AMENDMENT NO. CS-0011-109(1A)-2-AMDT-05(T)	Sl. No. 112	43 of 60	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized/pneumatic valves shall be shall be taken from the process water supply. The process water lines shall be provided with pneumatic/motorized valves as per the proven practice of the Bidder.	Bidder wish to clarify that all water line (like process water, equipment seal water, blow down water, clarified water, cake & belt wash water etc) shall be provided with pneumatic/motorised valves as per the proven practice of the Bidder.	Specification requirement is clear in this regard. Bidder is requested to follow the technical specification.
				1. Kudgi (3x800 MW) 9573-999-POC-F-001 Rev.8 (Civil Annex 6)	Kudgi 3X800 MW: Considering the challenge of construction in unit#1 due to space constraint, bidder requests employer to allow Commissioning/C.O.F of unit#3 first followed by Unit#2 and Unit#1 in this sequence.	Same shall be decided during detail Engineering.
				2. Lara (2x800 MW) 9548-999-POC-F-001 Rev.9 (Civil Annex 7)		
				3. Gaduanwara (2x800 MW) 9572-999-POC-F-001 Rev.7 (Civil Annex 8)		

**Lot1A Flue Gas Desulfurization Package
Clarification No.04 [Technical]**

TENDER NO PSER:SCT:NBN-C2059:20

S.No.	Section/Part	Clause No.	Page No	Clause	Clarification	NTPC's Reply
89	AMENDMENT NO. CS-0011-109(A)-2-AMDT-05(T)	Sl. No.-63	25 of 60	4. Darlipati (2x800 MW) 9549-999-POC-F-001 Rev.11 (Civil Annex 9) 5. Mouda (2x660 MW) 9561/9575-999-POC-F-001 Rev.12 6. Solapur (2x660 MW) 9571-999-POC-F-001 Rev.6 (Civil Annex 11) 7. Tanda (2x660 MW) 9562-999-POC-F-002 Rev.10 (Civil Annex 12) 8. Nabinagar JV (3x660 MW) 0370-999-PO-F-001 Rev.11 (Civil Annex 13) 9. Meja (2x660 MW) 0360/0361-999-POC-F-001 Rev.8 (Civil Annex 14) 10. Bathi (3x660 MW) 9558/9560-999-POC-F-001 Rev.9 (Civil Annex 15) 11. Nabinagar (4x250MW) 0270-999-POC-F-001 Rev. 9 (Civil Annex 16)		
90	AMENDMENT NO. CS-0011-109(A)-2-AMDT-05(T)	Sl. No. 136 (Mech Annexure-IV)	54 OF 60	Revised AUXILIARY POWER CONSUMPTION (PA) FOR EACH PROJECT is enclosed at Mech Annexure-IV	Bidder would like to clarify that Different units have different duct lengths and as such the guaranteed power consumption shall be different. Bidder requests employer to allow declaration of unitwise power consumption guarantees in attachment 3P (Rev-01). Further Bidder requests employer to allow declaration of unitwise guaranteed limestone consumption in the same Attachment 5P	
91	AMENDMENT NO. CS-0011-109(A)-2-AMDT-05(T)	Sl. No. 108	41 OF 60	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS: 803, latest edition. Additional Corrosion allowance of 1.5 mm on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Contractor. Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The tanks shall be of welded construction. Interior surface of the tanks shall lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 4 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness or Epoxy lining minimum three coats of 150 micron thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc.	Bidder understands that the total thickness of epoxy lining/paint shall be 3X50 micron = 150 micron (Total). Bidder requests employer to confirm the same.	As per the revised Auxiliary power consumption (Mechanical Annexure IV to Amendment 05(T)) Bidder to quote average Auxiliary power consumption for e.g. In case of one project is having two unit then Guaranteed APC shall be average of APC of U#1 and APC of U#2. With this provision Bidder's concern is already taken care. Bidder to guarantee Limestone consumption same for all unit as it is not dependent on layout. Bidder's understanding is correct.
92	AMENDMENT NO. CS-0011-109(A)-2-AMDT-05(T)	Sl. No. 142 C 59 OF 60		2x100% electric driven, single stage, integrally geared, single or dual vane centrifugal type / positive displacement (Helical lobe) type with VFD drive, oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber reaction tank.	Bidder understands that VFD shall not be applicable for centrifugal type oxidation blower with vane control. Bidder requests employer to confirm the same.	Bidder's understanding is correct. VFD is not mandatory for centrifugal type oxidation blower
93	AMENDMENT NO. CS-0011-109(A)-2-AMDT-05(T)	Sl. No. 134	53 OF 60	Mandatory Spares List (For each Project) - Cl. No. 1.01.00 to 1.17.00 revised attached as Mech Annexure III Sl No 1.02.00 Gates in Flue Gas System 1. Seals 2. Expansion Joints 3. Expansion Joints 4. Seals for guilloine gate (Both port side and bonnet side) (In case Gates are provided)		Regarding seals bidders understanding is correct. For Expansion joint, this shall be applicable for expansion joints of ducting.
94	AMENDMENT NO. CS-0011-109(A)-2-AMDT-05(T)	Sl. No. 144	59 OF 60	The absorber vessel shall be made of minimum 7 mm thick carbon steel. The absorber oxidation tank, absorber tower & absorber outlet duct up to absorber outlet flange shall be provided with 2 mm (minimum) thickness lining / cladding. Allow C276 / Alloy 59 or better material	Bidder understands that lining here implies wall papering as allowed in original Tender. Bidder requests employer to confirm the same.	It is clarified that only cladded plate of Alloy C276/ Alloy 59 or better material with Carbon steel base is allowed. Cladded plate can be manufactured by either rolling or explosion bonding process.
95	AMENDMENT NO. CS-0011-109(A)-2-AMDT-05(T)	Sl. No. 38	14 OF 60	"SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT" shall replace the "SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT" Amendment No.03 to Technical specification (Section-VI) (Amendment No. CS-0011-109(A)-2-AMDT-05(T)). Sl.No. 13, Page-8 of 102	Bidder requests employer to provide the missing bore log data for all the projects. Bidder has updated missing bore log data coordinates for each project.	All Bore log data available with NTPC for that vicinity has already been provided.

TENDER NO PSER:SCT:NBN-C2059:20