



TENUGHAT VIDYUT NIGAM LIMITED
2x210 MW Tenughat Thermal Power Station
Jharkhand
Dry Fly Ash Collection & Disposal System



10.00 INSPECTION, ERECTION, TESTING, COMMISSIONING AND HANDING OVER

10.01 All equipment covered under this specification will be subject to inspection and test by the Purchaser during manufacture, erection and commissioning. The approval of the Purchaser or passing of such inspection or test will not, however, prejudice the right of Purchaser to reject the equipment if it does not comply with the specifications when erected or does not give complete satisfaction in service. The cost of all such tests will be borne by the Bidder.

10.02 The Bidder will prepare and submit detailed quality plans for all items / components / equipment being manufactured / supplied by them or their sub- Bidders for this specification setting out the various stages of manufacture, the quality practice procedures to be followed by them, the relevant reference documents / standards, acceptance level, inspection documents raised, etc. An indicative programme of inspection/ test envisaged is given below. This is, however, not intended to form a comprehensive inspection and testing programme. Any tests, necessary for operation, safety and reliability point of view will be included and will be to the approval of the Purchaser.

10.03 The Bidder will conduct all tests required to ensure that the equipment furnished will conform to the requirements of this specification and in compliance with the requirements of the applicable codes. The particulars of the proposed tests and the procedures for the tests will be submitted to Purchaser for approval before conducting the tests.

The following tests will be carried out during and after completion of different component parts as applicable.

10.04 Shop Tests

10.04.01 All materials and castings used for equipments will be of tested quality. The test certificates will be made available to the Purchaser. Hardness tests will be carried out for all component materials.

10.04.02 The various components of the system will be tested according to the applicable codes and standards for meeting the performance



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requirements. In the absence of any standard these will be tested as per mutually agreed procedure between the Bidder and the Purchaser.

All tests will be carried out in presence of the Purchaser's representative. The Bidder will inform the Purchaser allowing adequate time so that the Purchaser if desires can witness the tests.

- 10.04.03 Hydraulic test will be carried on air receivers, pipes, valves, fittings, bends, elbows, etc. at 1.5 times the normal operating pressure.
- 10.04.04 All equipment will be visually inspected and checked for dimensional tolerance to match with the Purchaser's approved drawings/data.
- 10.04.05 The blowers, compressors, air dryers, heaters, pumps, fans, valves and cranes will be performance tested at shop as per applicable test codes / standards and as detailed elsewhere in this specification.
- 10.04.06 A comprehensive visual and functional check out for panels would be conducted.
- 10.04.07 All instruments will be tested as per the relevant sections of applicable codes which they conform to. The test certificates, alongwith the details of tests performed and results obtained, will be submitted to the Purchaser for his approval.
- 10.04.08 Determination of capacity, efficiency, power and characteristic curves of all pumps and drives.
- 10.04.09 Tests on all electrical equipment including motors will be as per details given in the electrical part of this TS.
- 10.04.10 Tests as per relevant standards and applicable codes including calibration tests of standard orifices, nozzles, pressure and temperature switches and other instruments, as applicable.



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10.05 Site Tests

10.05.01 The Contractor will prepare and submit detailed quality plans for each equipment under this specification from the receipt of material at site, during storage, erection, pre-commissioning to final commissioning of the plant. These procedures will necessarily include all check/tests conducted at site for preservation, assembly, alignment, positioning of the equipment, foundation preparation, welding/bolting, heat treatment, non-destructive examination, hydraulic test, running test / trial run test, performance test etc. The above will be discussed and finalised with the Owner. The Contractor will also furnish detailed quality procedures proposed by him for storage, preservation, painting, hydraulic test, air tightness test, performance test etc. to the Owner. The same will be discussed, finalised and approved by the Owner/Consultants before the commencement of respective site tests and such approved copies will be submitted in six copies.

10.05.02 System checking / Reliability Trials

Contractor will carry out tests at site to prove to the Owner that each equipment of the plant complies with requirements stipulated and is erected in accordance with requirements. Before the plant is put into trial operation the Contractor will be required to conduct tests to demonstrate to the Owner that each item of the plant is capable of correctly performing the functions for which it was specified. These tests may be conducted concurrently with those required under commissioning sequence.

10.05.03 The tests required will specifically include the following:

- a. Hydrostatic tests will be carried out on all pipelines at a pressure of 1.5 times.
- b. Checks on the operation of all controls of isolating and regulation valves.
- c. Checks on operation of all compressors, dryer, blowers, pumps, vent air fans, etc. to ascertain level of noise and vibration.



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- d. Test running of compressors, dryer, blowers, pumps, and vent air fans.
- e. Checks on operation of all heaters.
- f. Checks on operation of all individual control loops in the Ash handling system.
- g. Checks on interrelation between each separated control loop, if any.
- a. Calibration tests of instruments and control equipment to the extent, included in these specifications. Other tests will be conducted if required by the Owner to establish that the plant equipment is in accordance with requirements of the specification.

10.06 Erection

- a. The successful Contractor will perform the following with respect to the erection of the Plant and equipment supplied.
- b. The scope of work of the Contractor will be complete erection of the Plant and Equipments as given in the scope of work. The Contractor will make all arrangements to deliver the equipment at site by wagons / trucks / trailers, build his own stores (covered, uncovered, air-conditioned, if necessary) for the proper storage of equipment, maintain the stores and all related documents and records, transport the equipment to site for erection purpose. All security (watch & ward) arrangements also will be made by the Contractor.
- c. The Contractor will unpack and do visual checking against physical damages to the equipment / cases, clean equipment before start of erection. Damage shortage, if any, will be reported to the Owner / Consultant and will be rectified / replaced expeditiously, so as not to upset the erection and commissioning will not be considered an excuse for delay in completion of the work.
- d. The Contractor will provide all necessary erection equipment and tools & tackles including material handling equipment,



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cranes, compressors and other equipment and instruments and consumables, all commissioning equipment and theodolite, etc. which may be required for carrying out the erection and commissioning work efficiently. All instruments will be properly calibrated before use. Unless otherwise specified, the above erection equipment / material will be the property of the Contractor. However, Owner's prior permission will be required for removal of these erection equipment / materials from the site. The Contractor shall ensure that proper procedure and documentation should be maintained at owner's entry gate so that construction equipment & materials if required can be allowed to take back after completion of work.

- e. The Contractor will provide all temporary ladders; scaffolding materials; platforms, supports and other necessary facilities required for handling, erection, testing and visual inspection of suppliers at the point of installation and will also provide necessary packing plates, wedges, shims, leveling screws, etc. required for erection of equipment and structures.
- f. The Contractor will provide erection consumable like oxygen and acetylene gas, welding rods, solder lugs, oil, grease, kerosene, cotton waste, etc. required for erection of equipment and related steel structures and related civil work.
- g. The Contractor will erect and maintain his own site offices and stores as required for the work and arrange for maintaining in neat manner of the area placed at the Contractor's disposal. The site office will be handed over to Owner free of cost after completion of the project or will be dismantled and handover vacant land as directed by Owner.
- h. The Contractor will provide sufficient fencing, notice boards and lights to protect others as may be considered necessary by the Owner / Consultant. All materials used for providing these facilities will be properties of the Contractor.
- i. The Contractor will organize the work in a manner that other work being carried out simultaneously at site is not affected and the workmen not endangered and will arrange all temporary access as required for the erection work.



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- j. The Contractor will carry out base / primer and final painting of all Plant & Equipment, Structures, Pipelines, Tanks & Vessels, etc. supplied. The painting including its process will be carried out as per the requirement as have been laid down in the detailed technical specification. Where not specified, the same will be as per the standard codes & practices normally applicable and adopted internationally for the type of Plant & Equipment offered.
- k. All related civil work as specified including minor civil works, i.e chipping, grouting of the equipment, modification of existing civil/ structural foundation/ platform, steel structures foundations with approved non-shrink-grouting compound will be the responsibility of the Contractor. The materials required will be supplied by the Contractor.
- l. All safety, health and pollution control measures as required to be adopted as per the Statutory Regulations and the Safety Codes for projects issued along with the tender or otherwise required or implied by statutory regulations or the Technical specification. The Contractor will set up a suitable safety organization of his own at site in this regard.
- m. The erection of all plants and equipments will be carried out according to the latest engineering practices and according to the working drawings, specification, and instructions, etc. duly approved by the Owner. The Contractor will carry out the work in the presence of / as per the instructions of the site engineer / supervisory personnel deputed by the Owner. The erection will be carried out by highly skilled work men.
- n. The Contractor will supply all required consumables, construction and erection materials such as grouting material, welding materials, flushing & initial fills of lube oils (as per manufacturers / suppliers recommendation), petrol, diesel, Kerosene, bolts, nuts, packing sheets, gaskets, jute, cotton waste, emery papers, etc. as required for the satisfactory completion of work. Welding electrodes will conform to the latest revision of the standards / codes.



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- o. The Contractor will provide adequate nos. of skilled, semi-skilled and unskilled labours including riggers, welders, fitters, machanic, supervisory staffs; tools & tackles, etc. for completion of all equipment and piping systems within scheduled time.
- p. The Contractor will take care of positioning, leveling and plumbing of all equipments & pipelines within required accuracy and tolerance limit as specified by codes, manufacturer, client and consultant. It will be deemed as a contractual obligation that equipment are not thrown out of alignment or lifted off during commissioning and subsequent operation.
- q. The Contractor will be responsible for paying strict attention to statutory regulations for prevention of accidents and other safety rules.
- r. The Contractor will be responsible for safe handling of all equipments. If any damage takes place during erection and testing work, the same will be repaired / replaced by the Contractor to the satisfaction of Owner without any financial implication.
- s. Before erection, all parts of equipments, pipes, valves, fittings, etc. will be cleaned, checked, lubricated and inspected for ease of operation and any possible damage during transportation.
- t. After installation of equipments on the foundations, they will be leveled and aligned by means of sensitive spirit level, screw jack, dial and feeler gauges, etc. as per tolerances specified by equipments manufacturer / supplier. Number of packing plates / shims will be as minimum as possible.
- u. After alignment and leveling, equipment foundations will be chipped to remove any traces of oil & grease. The base frames will be grouted with the help of quick setting, non shrink cement. Sufficient time will be given for proper setting / curing before tightening the nuts of the foundation bolts. Tightening of the foundation bolts will also be done uniformly and diagonally.



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- v. After complete installation of equipments on foundations, alignment will have to be checked again to ensure tolerances. The equipment will be first rotated manually.
- w. All the pipelines will be provided with suitable slopes. Suitable vent with valve at the highest points and drains arrangement at the lowest points will be provided in the pipelines by the Contractor. Welded joints will be located at a distance equal to pipe diameter but not less than 100 mm from the beginning of the curve or pipe support locations. Radius of smooth bends of pipe will be at least 3 times the pipe diameter unless otherwise specified.
- x. Hooking up of all pipelines / services including supply of all valves, fittings as required for the same for all pipelines / services with existing pipelines / services at battery limits will be the responsibility of the Contractor.
- y. The Contractor will intimate the Owner at least one month in advance for requirement of any shutdown of the existing services for hooking up purpose. The Contractor will also prepare shutdown plan indicating time required, manpower and equipment planning, availability of all fittings etc. well in advance to Owner for approval.
- z. Access platforms & ladders are to be provided for the equipments, instruments, valves etc. which are not approachable from ground for operation & maintenance purpose.
- aa. The Contractor will return to the Owner all crates, packing boxes, packing materials and all surplus material brought to the site after completion of erection, testing & commissioning of the plant & equipment. All these materials will be kept at place and manner designated by the Owner.
- bb. The Contractor will clean and remove all surplus material, debris scraps, foreign material, metal chips, etc. from the plant area after completion of erection, testing and before commissioning.



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10.07 Construction Water

Construction water will be supplied by the Owner to the Contractor at a single point at battery limit. The Contractor will make his own arrangements to lay and maintain necessary distribution lines from these points at his own cost. The requirement of construction water will be indicated by the Contractor in his offer.

10.08 Construction Power

The Contractor will be provided with construction power at 415 V for the purpose of the erection / construction under the Technical specification only at one point in the project "Site". The Contractor will make his own arrangements to lay and maintain necessary supply lines for temporary power from that point. The Contractor will make his own further distribution arrangement. All temporary wiring must comply with local regulations and will be subject to the Owner's / Consultant's inspection and approval before connection to supply and later.

Non-availability of power from the Owner will not be an excuse for delay in completion of erection / construction.

The Contractor will supply and install switches, fuse units of suitable rated capacity separately for power and lighting on a frame preferable of steel and provide rain water protection cover on the switches. The installation will be made as per relevant rules and site locations which are to be finalized in consultation with Owner's personnel.

Display of danger board signs in Hindi and English languages near switches is to be ensured by the Contractor.

The Contractor will supply and install all distribution cables, wires and switches, etc. of rated capacity for the work starting from the source of power at his own cost. He will employ Electricians having valid Electrical Licence for carrying out the installation as well as for the maintenance works.

The Contractor will provide proper facilities to the Owner of the Plant concerned of his authorized representative for inspecting his temporary electrical installation as and when required. The



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Contractor will immediately attend to the defects so pointed out during this inspection including replacement of faulty cables, switches, fuses etc..

The Control will not effect any change in the temporary installation unless permission is obtained from the Owner or his authorized representative.

The requirement of construction will be indicated by the Contractor in his offer.

The Contractor will be responsible for all damages, losses etc. due to fire or otherwise if it is due to his negligence, improper installation, operation and / or maintenance of his part of installations.

10.09 Allotment of land

Land will be allotted for the purpose of Site Office, Stores and fabrication yard. However, allotment of land will be subject to mutual discussion and agreement because of limited availability of space.

The allotment will remain valid till the period of technical specification and will automatically cease after expiry of the guarantee period of the technical specification. The validity will also automatically cease on termination of technical specification due to any reason whatsoever.

The Contractor may build only temporary structures on the land allotted to him.

On completion of the work and expiry of the guarantee period, the Contractor will remove all temporary structures built by him and restore the land to its original condition unless otherwise advised by the Owner.



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10.10 **Definitions**

a) **Mechanical Completion**

When all the engineering is completed, all the building work has been completed, all equipment and machinery are installed and aligned all piping and instrumentation work is completed, all hydrostatic / pneumatic testing is done, speed and direction of rotation of all prime movers is checked, relays are set and all scales, meters, measuring devices and recorder are calibrated, the Contractor will notify CLIENT in writing that the plant is ready for occupation in all respect and is ready to start.

b) **Pre-commissioning Activities**

Pre-commissioning activities defined as activities required to be performed after erection / installation, hydro testing, etc. of an equipment / system to make them ready for commissioning. This will include but not limited to the activities like system checking as per approved P & I drawings, site modification, inspection of equipments, calibration of instruments, checking of the electrical equipments for proper earthing continuity, insulation resistance, primary and secondary injection test of relays after insulation resistance, conducting operability test on individual equipments / systems, supply and charging of lube oil and other chemicals. Fabrication and supply of such temporary facilities as for example, temporary bypasses, spools, blinds, jump over, vents, etc., which will be required to carryout pre-commissioning activities.

c) **Ready for Commissioning**

The plant will be considered "Ready for Commissioning" when all the facilities have been completed along with its auxiliaries and support facilities in every respect including charging of lube oil, any last minute modifications as recommended by the Owner / Consultant, all temporary structures, scaffolding, etc. used for carrying out pre-commissioning works have been removed, all the blinds /



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blanks have been put in position as required by process, all systems as recommended have been purged and pressurized, and the plant has reached to a stage of ready for commissioning and acceptable to the Owner / Consultant.

The Contractor will issue a certificate of “Ready for Commissioning” of plant, for acceptance by Owner.

10.11 Pre-commissioning & Commissioning

Contractor will be responsible to carry out pre-commissioning and commissioning of complete Plant and Equipment supplied. Contractor will document elaborating different activities with schedule for pre-commissioning and commissioning. The document will cover the following as minimum.

- i) Description of facilities / Equip. Layout drawing with clear legends
- ii) Start up procedure
- iii) Normal operation procedure
- iv) Shut down procedure (normal / emergency)
- v) Operating parameters and set points of different alarms and trips.
- vi) Summary of utilities consumption (normal & maximum)
- vii) Lubrication schedule and identification of equivalent available in India.
- viii) Fire and safety system.

The manual will have the following attachments as a minimum:

- i) Reduce size copies of line lists and valve schedules
- ii) Equipment and instrument data sheets
- iii) Electrical single line diagram
- iv) Area classification drawings
- v) Pump characteristics curve
- vi) Piping and instrumentation diagram
- vii) All shut down schemes
- viii) Safety logic diagram
- ix) Recommended proforma of log books for major equipments



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10.12 Commissioning

It will be the responsibility of the Contractor to carry out the commissioning activities of the plant (after successful mechanical completion and pre-commissioning activities duly witnessed by the Owner / Consultant), under necessary guidance and overseeing of Licensor, if any.

One month in advance of starting the commissioning, the Contractor will submit proposal to the Owner giving details of the programme to be followed during commissioning. This will be checked by Owner / Consultant. Contractor will depute trained operation team to carry out plant start up and commissioning and process operations and maintenance under the overall guidance of the Owner / Consultant. Contractor also be required to associate Owner's operation personnel in all the day to day pre-commissioning, commissioning, maintenance activities and process operations. However, responsibility for adequate manning and commissioning of the plant will be that of the Contractor.

The plant will be considered to be commissioned successfully when all the systems, with instrumentation / control systems, process utilities and support systems have been on uninterrupted stable operation for continuous 72 hours at rated parameters under specified condition.

Acceptance & Handing over

- a) The Contractor will supervise the Acceptance Tests to ensure that the plant and equipment supplied by them meet Owner's system requirement.
- b) Acceptance Test for system, equipment and pipelines covered in this specification will be conducted unit wise or group wise within a reasonable period after the completion of erection work which will be mutually agreed upon.
- c) Commissioning certificate of the plant as a whole will be issued only after complete facilities have been commissioned and satisfactory operated for a period as specified at required parameters at rated output.



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- d) Any defects found in the supplied plant & equipment during commissioning will be rectified by the Contractor at his own cost failing which the Owner reserves the rights to take remedial measures at the Contractor's cost or reject the plant and equipment as deemed necessary.

After successful commissioning of the plant and equipment, there will be formal handing over and taking over of the plant between Contractor and the Owner as specified in the tender.

10.13 Deputation of experts for Supervision of Erection, Commissioning and Performance Guarantee Tests.

The Contractor will depute Engineers / Specialists at site from various disciplines for supervision of erection, commissioning and performance guarantee tests of the Plant and equipment with their auxiliaries in addition to the site team for carrying out site activities.

If some of the experts are required by the Owner beyond the contractual period for further supervision of operation of the plant & equipment, the Contractor will provide such services in accordance with the mutually agreed terms & conditions between the Owner and the Contractor.

10.14 Manufacturer

It will be responsibility of the Contractor to arrange to get service of Manufacturer's installation / commissioning engineer at site during mechanical completion / commissioning of all the major equipments and systems for the plant.

The Contractor will plan availability of personnel / experts indicated above, well in advance to match with the requirement. Also the Contractor will ensure the continuity for concerned experts / personnel till completion of the work. Short time deputations of different persons will be avoided.



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10.15 **Spares and Consumables**

Spares – The Contractor will be responsible for the supply of all spares till the plant is handed over to the Owner. In addition to this, spares as per enclosed annexure for operation of plant will be supplied by the Contractor to the Owner.

Consumables – The Contractor will be responsible for supply of all the consumables for startup and commissioning and till handing over the plant & equipment to the owner.