Section III

SPECIAL CONDITIONS OF CONTRACT

TABLE OF CLAUSES

Clause Number

Section III

SPECIAL CONDITIONS OF CONTRACT

The following Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract (GCC). Since the Special Conditions of Contract (SCC) refer to or amend the provisions in the GCC, for easy reference, the corresponding clause number of the GCC is indicated in parentheses.

1. Definitions (GCC Clause 1)

GCC 1.1 (c) – Add "and spare parts" between "---material" and "which the Supplier ---"

GCC 1.1 (d) – " — technical assistance ---" shall be read as " — technical assistance and supervision ---"

GCC 1.1 (e) – The Purchaser means "The 4th Thermal Power Plant" and "the Goods" shall be read as "the Goods and Services".

GCC 1.1 (f) – The Purchaser's country is: Mongolia

GCC 1.1 (i) – The Project Site is: The 4th Thermal Power Plant in Ulaanbaatar, Mongolia and such other places as will be designated by the Purchaser from time to time

"The Project Site " shall be read as "The Project Site or The Site".

Add the following definitions

GCC 1.1 (k) – " The Works " means "the Goods" and "the Service"

GCC 1.1 (l) – "The Engineer" means the personnel appointed by the Purchaser to act as Engineer for the purposes of the Contract.

GCC 1.1 (m) – " The Trial Run " means the 5 days' continuous full load operation for each Boiler.

GCC 1.1 (n) – " The Provisional Acceptance " means the successful fulfillment of the Trial Run for each Boiler.

GCC 1.1 (o) – "The Specification" means the Technical Specification (Section IV) and technical information/data which, during the Contract, will be furnished by the Purchaser.

2. Contract Execution Schedule

As specified in Technical Specifications

3. General Requirements		The Supplier shall have in Ulaanbaatar a local agent or office vested with sufficient power to deal with the performance of the Contract until the completion of the Contract.
4. Use of Contract Document and Information (GCC Clause 2)		Add the following Clause 2.4
	2.4	Contract Documents The several documents forming the Contract are to be taken *mutually explanatory of one another, but in case of ambiguities or* discrepancies the same shall be explained and adjusted by the Engineer who shall thereupon issue to the Contractor instructions thereon and in such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows: (1) the Contract Agreement (if completed); (2) the Minutes of Meeting of contract negotiation (3) the Letter of Acceptance; (4) the Bid Form and Price Schedules; (5) the Conditions of Contract Part II -- Special Conditions; (6) the Conditions of Contract Part I – General Conditions; (7) the Specifications and Drawings;
5. Subcontracts (GCC Clause 5)	5.1	Delete the sentence "of the subcontracting and the subcontractor"
6. Eligibility of Goods (GCC Clause 6)		All countries and areas are eligible.
7.Inspection and Tests (GCC Clause 7)	7.2	"inspectors" shall be read as "the inspectors nominated by the Purchaser"
		Add the following Clauses
	7.6	The Purchaser shall be entitled at all times to inspect, examine and witness tests on the *Goods* supplied under the Contract before each delivery. Notwithstanding such inspection, examination and witnessing of tests, the Supplier shall be responsible for the Works.
	7.7	All expenses including business class air fare, board and lodging, etc. to be incurred to the Purchaser's representatives to attend the tests and inspections carried out outside Mongolia shall be born by the Supplier.
8.Packing (GCC Clause 8)	8.2	"the Special Conditions of Contract" shall be read as "the Special Conditions of Contract and/or the Specification".

9. Delivery and Documents (GCC Clause 9)

9.1 "the Special Conditions of Contracts" shall be read as "the Special Conditions of Contract and/or Technical Specification"

Add the following Clause.

9.3 For Goods supplied from outside the Purchaser's country DDP, unloaded and in custody at the Site.

Upon shipment, the Supplier shall notify the Purchaser and Insurance Company by fax the full details of the shipment, including Contract number, description of Goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge, etc. The Supplier shall mail the following documents to the Purchaser, with a copy to the Insurance Company:

(i) 7 copies of the Supplier's invoice showing Goods' description, quantity, unit price, and total amount;

(ii) original and 2 copies of the negotiable, clean, on-board bill of lading marked "freight prepaid" and 5 copies of non-negotiable bill of lading;

(iii) two (2) originals and five (5) copies of the packing list identifying contents of each package;

(iv) insurance certificate;

(v) Manufacturer's or Supplier's warranty certificate;

(vi) Inspection certificate, issued by the nominated inspection agency, and the Supplier's factory inspection report; and

(vii) Country of origin.

The above documents shall be received by the Purchaser at least one week before arrival of the Goods at the port or place of arrival and, if not received, the Supplier will be responsible for any consequent expenses.

10. Performance Security (GCC Clause 11)

11.1 "in the Special Conditions of Contract" shall be read as "in Clause 11.5" and "within thirty (30) days" shall be read as "within twenty eight(28) days".

11.4 "—— not later than warranty period ——" shall be read as " —— within thirty (30) days after the expiration of the Warranty Period - ——".

11.5 Add the following Clause

The amount of performance security, as a percentage of the Contract Price, shall be ten (10) percent of the Contract Price.

11. Insurance (GCC Clause 12)

12.1 "Goods" shall be read as "Works" and insert sentence "unloading and storage at the Site," after " ---- storage and delivery,".

Particular Insurance Requirements:

Marine cargo insurance in the currency of the Contract cover 110% of CIF price of the Goods against All Risks under Institute Cargo Clause and Wars, Strikes, Riots and Civil Commotions under Institute War Clauses, with Special Clause for Concealed Damage, taken out form a insurance company acceptable to the Purchaser.

12. Warranty (GCC Clause 13)

Particular Guarantees or Warranties:

Clause 13.2 shall be read as follows;

13.2 The Warranty shall remain valid for twenty four (24) months for No.5 and No.6, eighteen (18) months for No.7 and twelve (12) months for No.8, after the issue of Provisional Acceptance Certificate for the Works of each Boiler.

13.4 Delete the sentence "other than, where applicable, the cost of ----- to the final destination"

13. Payment (GCC Clause 14)

Disbursement procedures of JBIC ODA Loans shall be applied for disbursement of the proceeds of JBIC ODA Loans for eligible payment under this contract.

Add the following Clause:

14.5 For Works supplied from outside the Purchaser's country, the Purchaser will pay to the Supplier as follows:

(a) **Advance Payment:** Ten (10) percent of the Contract Price shall be paid within thirty (30) days of signing of the Contract, and upon submission of claim and an unconditional bank guarantee issued by a Bank which is acceptable to the Purchaser for the equivalent amount valid until the Goods are delivered and in the form provided in the bidding documents or another form acceptable to the Purchaser.

(b) **On Shipment:** Fifty (50) percent of the Price of Works for each Boiler shall be paid through irrevocable confirmed letter of credit opened in favor of the Supplier in a bank in its country under the commitment procedure for JBIC ODA Loans, upon submission of documents specified in Clause 9 of the General Conditions of Contract.

(c) **On unloaded at the Site:** Twenty five (25) percent of the Price of Works for each Boiler shall be paid within thirty (30) days after the confirmation of the notification of unloaded issued by the Supplier.

(d) **On Provisional Acceptance:** Ten (10) percent of the Price of Works for each Boiler shall be paid within thirty (30) days after the date of Provisional Acceptance Certificate issued by the Purchaser of the Goods accepted upon submission of claim supported by the Provisional Acceptance Certificate.

(d) **On Expiration of Warranty:** Five (5) percent of the Price of the Works for each Boiler shall be paid within thirty (30) days upon expiration of the Warranty Period specified in Clause 13 of the General Conditions of Contract, upon submission of claim supported by the Final Acceptance Certificate issued by the Purchaser, unless otherwise specified in these Special Conditions of Contract.

14. Extensions in the Supplier's Performance (GCC Clause 16)

16.1 "Goods" shall be read as "Works".

16.2 Delete sub-clause (b).

15. Liquidated Damages (GCC Clause 17)

17.1 Applicable rate: as specified in the Specifications.

"the Special Conditions of Contract" shall be read as " the Special Conditions of Contract and/or Specifications".

Maximum deduction: as specified in the Specifications.

16. Resolution of Disputes (GCC Clause 21)

Add the following Clause

21.3 The arbitration shall be carried out in an international forum under the Rules of Conciliation and Arbitration of the International Chamber of Commerce by three arbitrators selected in accordance with said Rules and subject to the following: the place for arbitration in Ulaanbaatar, Mongolia; the applicable law; England Law, the language for arbitration English; and the arbitration award shall be final and binding on the parties.

17.Taxes and Duties (GCC Clause 26)	26.1	All taxes and duties imposed on the Goods in Mongolia under this Contract are exempted.
18. Spare Parts		As specified in the Technical Specifications.
19. Compatible Production		The Supplier is requested to be able to supply equipment and materials compatible with Goods during ten (10) years after the expiration of Warranty Period.

Section Ⅳ

Technical Specification

TABLE OF CLAUSES

SECTION IV TECHNICAL SPECIFICATION

1. PLANT DESCRIPTION

The 4th thermal power plant is composed of eight (8) boilers and six (6) turbines/generators. All of the super-heater outlet steam pipes of the boiler are connected to the main steam header, from which steam is led to each turbine.
On the other hand, feed water to the boilers is led from the feed water main header (See attached drawings MON-K-0-12 and -13). Boilers are of indoor with pulverized coal firing, radiant, non-reheat, natural circulation type and Generators are of hydrogen cooled horizontally mounted cylindrical rotor, rotating field type. Their main features are as follows;

(Boilers)	
Maximum continuous evaporation	420 t/h
Steam pressure at super-heater outlet	140 kgf/cm^2
Steam temperature at super-heater outlet	560 °C
(Turbines)	
Rated output	80MW(#1,5,6), 100MW(#2,3,4)
Inlet steam pressure	130 kgf/ cm^2
Inlet steam temperature	555 °C
(Generators)	
Rated capacity	125,000 kVA
Power factor	0.8 (lagging)
Rated voltage	10,500 V
Rated current	6,875 A
Rated frequency	50 Hz

The layout of the power plant is shown on the attached drawing No. MON-K-0-11.

The boilers and turbines are supervised and controlled from the central control room (CCR). The CCR is divided into two (2) rooms; one for #1, 2, 3, 4 boiler and #1, 2, 3 turbine, the other for #5, 6, 7, 8 boiler and #4,5, 6 turbine. All the generators including excitation systems are supervised and controlled from each local panel and/or from the electrical central control room (ECCR). (Refer to attached drawings No. MON-K-0-10, MON-K-0-11)

2. SCOPE OF THE GOODS AND SERVICES

2.1 General

In General, scope of Works of the Package-1 is modification and replacement of existing semi-direct pulverized coal feed system including coal burners for the conversion to the direct firing system for #5,6,7 and 8 boilers.

Detailed scope of conversion is shown hereafter (See attached drawings MON-K-1-01).

The Works to be performed modification and rehabilitation of existing system comprises the design, manufacture, shop test, marine and inland transportation to the Site designated by the Purchaser, the supervision work for the erection work at the Site, the commissioning works, the trial run under operation of boiler, and other necessary Services.

Scope of the Works shall include:

- Replacement of pulverizers, coal feeders, primary gas fans and burners including all necessary accessories
- Modification of bunkers, hot gas ducts, cold gas ducts and pulverized coal pipes
- HV&LV switchgears including necessary accessories
- Designing and Manufacturing
- Transportation
- Supervision, Commissioning, Trial run and Training

2.2 Scope of the Works

The Works to be supplied and performed by the Supplier under this Contract shall be referred to Clause 12 to 16. Whereas the Goods is specified in Clause 12, and the Services is specified in Clause 13 to 16.

The Supplier shall:

(1) Perform the visual inspection at the Site for the design (modification work, interface with the existing equipment, etc.) before design of the Goods.

(2) Ensure proper matching of design, manufacture, supply and trial run, including start-up, shut-down and emergency conditions.

(3) Co-operate with the Purchaser in formulating procedures for handling and maintenance of the Goods.

(4) Facilitate witness of the Purchaser.

(5) Co-operate with the Package-5 Contractor and Package-2 Supplier.

The Services to be provided by the Supplier shall include, among others, the provision of supervisory services by experts in the number and qualification adequate for the successful erection work. The Supplier shall be responsible for the safety, protection and security of the experts and other personnel dispatched to the Site by him.

3. TIME SCHEDULE, KEY DATES AND PERIOD

3.1 Implementation Schedule

The completion of the Rehabilitation Project is reckoned from the effective date of the Contract up to the Provisional Acceptance of the Works, "Implementing Schedule" drawing No.MON-K-0-01 is attached.

The Supplier shall submit his proposal for the detailed schedule together with his Bids.

The schedule shall include the following items :

- effective date of the contract
- design and engineering
- manufacturing
- transportation
- removal of existing equipment and civil work
- erection and installation
- test and commissioning
- trial run
- date of provisional acceptance

3.2 Key Dates and Periods

The following are considered contractual key dates and periods in the execution of the Rehabilitation Project.

3.2.1 Effective Date of Contract

The effective Date of Contract is the Contract signed date.

3.2.2 Delivery Dates of the Goods at the Site

The Supplier shall deliver and unload all the Goods at the Site or the specified place by the Purchaser, by the date not later than :

Delivery 1 (1st Unit) : Thirteen (13) months after the effective date of the Contract

Delivery 2 (2nd Unit) : Nineteen (19) months after the effective date of the Contract

Delivery 3(3rd Unit) : Twenty-five (25) months after the effective date of the Contract

Delivery 4(4th Unit) : Thirty-one (31) months after the effective date of the Contract

The Supplier shall submit his proposal for the above delivery dates filling in the Technical Schedules. (Form is attached)

3.2.3 Date of Completion of Erection Work

All the Goods shall be assembled, installed, connected and made ready for starting the commissioning, by an erection Contractor of Package-5 under supervision of the Supplier.

3.2.4 Commissioning

The Supplier shall execute the commissioning for all the Goods to be supplied under this Contract.

Upon the notice of the Supplier, the Purchaser shall give the certificate of completion of the commissioning for each Unit.

The details of the commissioning shall be referred to Clause 13.

3.2.5 Trial Run

Upon the completion certificate of the commissioning the Supplier shall start the Trial Run under support of the Purchaser.

The Trial Run shall be continued for not less than five (5) days.

For further details of the Trail Run shall be referred in the Clause 14 .

3.2.6 Date of Provisional Acceptance for all Work

Upon completion of the Trial Run for each Unit the Purchaser shall issue the Provisional Acceptance Certificate.

3.2.7 Warranty

The Supplier shall warrant the Works to the Purchaser for a period of twenty-four (24) months starting from the date of the issuance of the Provisional Acceptance Certificate for 1st and 2nd Unit / eighteen (18) months starting form the date of the issuance of the Provisional Acceptance Certificate for 3rd Unit / twelve (12) months starting from the date of the issuance of the Provisional Acceptance Certificate for Last (4th) unit /.

The Supplier shall be responsible for making any defect in or damage to any part of the Goods which may appear or occur during the Warranty Period and which arises from any defective materials, design, workmanship, transportation or commissioning.

The Supplier shall make good the defect or damage as soon as practicable and at his own cost.

The Supplier shall also refer to this Bidding Document Section II , Clause 13 "Warranty".

4. LIQUIDATED DAMAGE

In the event the Supplier fail to complete the delivery of the Goods and documents/drawings within the contracted time period, such failure shall be a default under the Contract, the Supplier shall be liable for payment to the Purchaser as liquidated damage and not be way of penalties.

The liquidated damages shall be in the amount of one-tenth of one percent (0.1%) per day of one-fourth (1/4) of the total Contract Price except those specified in the following Table.

The total amount of liquidated damage under this Clause shall be limited to a maximum ten percent (10%) of the total Contract Price:

Portion of the Goods and Documents	Liquidated Damages
Each delivery of the Goods	0.1% of 1/4 of the total Contract Price per day
Each delivery of the materials needed during the civil work periods	100,000 J. Yen per day
Submission of drawings and information necessary for the foundation work of the Goods	100,000 J. Yen per day
Submission of operation manuals	100,000 J. Yen per day
Submission of maintenance manuals	100,000 J. Yen per day
Each period from the date of commencement of the commissioning up to the date of Provisional Acceptance	0.1% of 1/4 of the total Contract Price per day

5. DATA, DRAWINGS AND DOCUMENTS

5.1 Drawings Attached to the Bidding Document

5.1.1 Purchaser's Drawings

(1) Purchaser's Drawings attached to the Bidding Document

The drawings contained in the Bidding Document shall be utilized for bidding purposes only. They are not considered as necessarily defining the design of the Goods to be furnished, but are merely illustrative to show the general layout of the equipment, except where limiting or mandatory dimensions and elevations are indicated.
The Works shall be executed in accordance with the detailed design drawings prepared by the Supplier.

(2) Copyright

Copyright for drawings of existing equipment shall be remained to the Purchaser.

5.1.2 Proposal Drawings, Documents and Technical Schedules

The Supplier shall submit the Technical Schedules fully completed together with documents and drawings specified in this Bidding Document and other documents which the Supplier deems useful to better evaluate his Bid.

5.2 Supplier's Drawings, Documents, Data and Instructions

5.2.1 General

The Supplier shall submit to the Purchaser for approval or reference, drawings, plans, erection manuals, calculations, codes and standards, copies of all documents necessary for implementing the Works in accordance with the provisions of the Contract Document. The sequence of submission shall be such that information is available for review or approval of each drawing or document when it is received.

The scope of these submittals shall include, but not be limited to those specified and shall be sufficiently comprehensive to fully establish that all parts and procedures to be used in performing the Works comply with the objectives of the Contract. The Purchaser will have

the right to require the Supplier to submit such additional information as may reasonably be required.

The Supplier shall, within one (1) month after the effective date of the Contract, prepare and submit to the Purchaser for approval a schedule of documents which he proposes to submit in accordance with the requirements of Clause 5.2.4 below and the other clause of this Bidding Document, together with the dates on which he proposes to submit such drawings and documents.

The schedule of documents summarizing all existing and proposed drawings and documents of items intended for submission to the Purchaser shall be updated monthly to show the status of the drawings and documents submitted and any additional proposed drawings. These updated lists shall be submitted to the Purchaser by seventh (7^{th}) day of the every month.

Any manufacturing, test and transportation of the Goods prior to the approval of drawings pertinent thereto shall be at the Supplier's risk. The Supplier shall be responsible for any extra cost that may arise in consequence to such risks.

When submitting drawings for approval, including drawings prepared by a sub-supplier (if any), the Supplier shall certify that the Supplier has fully examined such drawings and that drawings comply with the requirements of the Contract.

The Supplier shall be responsible for any discrepancies, errors, or omissions in the drawings, documents and data supplied by him whether these have been approved by the Purchaser or not.

The Purchaser shall have the right to require the Supplier to make any changes to the drawings, documents and data which may be necessary, in the opinion of the Purchaser, to make the Works conform to the intent of the Contract.

All revisions of drawings shall be clearly described in the revision column and be indicated on the drawing by means of a triangle bearing the revision number.

All drawings, documents, data and information to be submitted shall be in English language and be drawn using the metric system of measurements. Refer to Clause 7 (2).

Every drawing shall carry a title block with the Contract Number and a space shall be made in the title block for incorporating the Project Drawing Number.

The first lines of the title block shall read:

Rehabilitation Project of the 4th Power Plant in ULAANBAATAR, MONGOLIA (PHASE-II)

CONTRACT NO._____

Where applicable, drawings shall show a graphic scale key plan and north arrow. Lettering, notes and title block shall be in English language. Dates on drawings shall be spelled out (e.g. 28 Dec. 2002).

5.2.2 Processing Drawings for Approval

Prior to fabrication of the Goods at the factory or to the award of order to the Sub-Suppliers, the Supplier shall submit to the Purchaser and the Engineer seven (7) copies of printed drawings and documents for approval, with a mark or stamp "FOR APPROVAL". All the others shall be submitted as "FOR INFORMATION".

The Approval procedure shall in principle be treated in accordance with following procedure.

(1) The Purchaser will review the submitted drawings and documents within fifteen (15) days after receipt. The Supplier shall confirm the receipt date of submitted drawings and documents. It is noted that even for "FOR INFORMATION", the Purchaser treat it as "FOR APPROVAL" and send comment.

(2) After the drawing and documents are approved or reviewed by the Purchaser, the Purchaser will send his comments to the Supplier by a facsimile discriminating with marks "APPROVED", "APPROVED WITH NOTES", "NOT APPROVED" or "FOR INFORMATION".
In case that the Supplier has not received any comments from the Purchaser after twenty (20) days after submission, the Supplier shall be deemed that submitted drawings and documents are "APPROVED".

(3) The drawings and documents "FOR INFORMATION" with the comments of the Purchaser are deemed to be "FOR APPROVAL".

(4) The drawings and documents with the mark "APPROVED", "APPROVED WITH NOTES" will authorize the Supplier to proceed the Works if the Supplier completely accept the Purchaser's comments. Any design or manufacturing done before approval of the drawings shall be at the Supplier's own risk.

(5) The drawings and documents marked with "NOT APPROVED" shall be revised by the Supplier and resubmitted for approval to the Purchaser.

(6) In any case, the Purchaser shall not return the Supplier's drawings or documents

(7) Initially supplied drawings and documents shall have the revision number "Rev.0". Subsequent revisions shall be numbered as Rev.1, Rev.2 . . . until approval. All revisions shall be clearly described in the revision column and indicated on the drawings with Rev number in framed by triangle.

5.2.3 As-Built Drawings

(1) Revision and/or modification made to the Goods during erection work and commissioning periods shall be correctly and completely reflected into all the concerned drawings and documents as the "AS-BUILT" drawing by the Supplier.

(2) Record Drawings

Prior to the Provisional Acceptance of the Works for the final Unit, the Supplier shall submit to the Purchaser five (5) prints and two (2) CD-ROM of all duly checked and approved " AS-BUILT " drawings.

5.2.4 Submission of Drawings, Documents and Data

The Supplier shall prepare and submit to the Purchaser for approval or reference, drawings and technical data/documents including but not limited to the following:

(1) Codes and Standards

The Supplier shall, within one (1) month after the effective date of the Contract, submit for approval by the Purchaser a list of the Codes and Standards which shall govern the design, manufacture, construction, erection, test, commissioning and trial run of all the related Works under this Contract.

Each one(1) copy of the applied code or standard shall be supplied to the Purchaser.

(2) General Arrangement Plans for Machinery and Equipment.

The Supplier shall supply layouts, arrangement and location of the Goods including the outline dimensions and sizes of the Goods.

The Supplier shall, within two (2) months after the effective date of the Contract, submit for approval the above.

(3) Drawings, Documents and Specifications of Electro-Mechanical Equipment for Approval

The data, drawings and documents to be submitted by the Supplier for approval as listed bellow.

(a) Flow and Material balance diagrams (gas flow, coal flow, temperature and pressure) for
- Boiler evaporation 420 t/h
- Boiler evaporation 210 t/h

(b) Design specifications of pulverizers, primary gas fans, seal air fans, coal feeders, coal burner and their electric motors as well as their Metal Clad Switchgear and Motor Control Center

(c) Technical data sheets

(d) *Arrangement drawings for*
- Pulverizers including their maintenance space
- Primary gas fans
- Seal air fans
- Hot and cold gas ducts
- Coal chutes
- Coal feeders
- Pulverized coal pipes
- Coal burner
- Metal Clad Switchgear and Motor Control Center
- Overall system for #5 to #8 boilers

(e) Design and Engineering for foundation work (with motor) and drawings for execution to meet the existing foundations or area for
- Pulverizer and subsidiary equipment
- Primary gas fan
- Seal air fan
- Coal feeder
- Metal clad switchgear and motor control center
- Other equipment as necessary

(f) Single line diagram giving rating of each equipment

(g) Protection system for electric motors

(h) Relay co-ordination

(i) Control and operation write up/Block logic diagrams

(j) Control schematic and wiring diagram.

(k) List of local control and instrumentation

(l) Characteristic curves of

- Primary gas fan
- Pulverizer load vs Primary gas fan flue gas flow
- Pulverizer load vs Pulverizer inlet flue gas temperature required
- Coal feeder speed vs coal flow (apparent coal density: 0.8)

Correction curves for pulverizer's performance in case of change of

- Fineness of pulverized coal
- Hardgroove Index (HGI)
- Total moisture and/or Surface moisture of raw coal at coal feeder outlet
- Other parameters which the Supplier considers to be needed

(m) Utility consumption – kW consumed, Lubricating oil consumption and so on

(n) Cable schedules and interconnection together with cable route drawing

(o) Spare parts list

(4) Drawings, Documents and Specifications for Electro-Mechanical Equipment for Reference use

(a) Weight of each main components of the direct firing system proposed

(b) Outline or Assembly drawings together with cross sections of

- Pulverizer with gear and motor
- Primary gas fan with motor
- Seal air fan with motor
- Coal feeder
- Coal burner

- Mono-rail and hoist
- Metal clad switchgear and motor control center

(c) List of special tools for maintenance

(d) Design calculations in support of selection of equipment rating and system design

(5) Progress Report

(a) Monthly Reports

The Supplier shall submit to the Purchaser and the representative of the Purchaser (such as Engineers if required) by tenth(10th) day of every month, a written detailed progress report, in an approved form, indicating the stage reached and anticipated completion dates for the design, ordering, procurement, manufacture, and testing of the components up to the completion date of transportation of the Goods. The report is to be forwarded promptly so that on receipt by the Purchaser the information is not unduly out of date.

Further the Supplier shall submit the progress report during Site test and commissioning period in the same manner as above.

(b) Weekly Meeting

All Parties concerned to this Contract shall have a weekly meeting every week after commencement of erection work at the Site and make the minutes of meeting.

(6) Instructions for Erection Works

The erection work will be undertaken by an Erection Contractor under supervision of the Supplier. The Supplier shall provide the instructions for the erection work of the Goods supplied by this Contract. The preliminary instructions for the erection work shall be submitted not later than three(3) months after the effective date of the Contract, and the following items shall be included at least and other necessary information shall be included:

- Outline of erection procedures
- Equipment and instrument list
- Layout of equipment
- Dimensions and weight of equipment
- Approximate cable length

- Preliminary wiring diagrams
- Recommended erection schedule
- Other necessary information

The final erection instructions shall be submitted three (3) months before the commencement of the erection work and the following items shall be included at least:

- Erection procedures
- Layout of all Goods
- Dismantling procedure of the existing equipment and foundation
- Detailed equipment & instrument list
- Outline drawings of all equipment
- Civil work drawings for foundation of equipment
- P & I diagrams
- Piping drawings
- Cable wiring diagrams
- Cable tray and/or duct drawings
- Special erection tools and machines to be recommended
- Other necessary information

(7) Test Procedures and Reports

The Supplier shall submit to the Purchaser comprehensive test procedures/ programs two (2) months prior to the start of the actual tests of the Goods.
The procedures shall include the following items, but not limited to:

- description on the test activities
- test circuit diagram including test instrumentation
- evaluation criteria for the test results
- form of test record

The Supplier shall submit reports or test results upon completion of the tests carried out in accordance with the Bidding Document including those in the manufacturer's works.

(8) Operation Manuals

The boiler operation manual shall be prepared and submitted under the cooperation of the Suppliers of Package-1 and Package-2 on the basis of the existing boiler operation manual prepared by the Purchaser.

Two (2) sets of draft of the manuals shall be submitted for review of the Purchaser within thirteen (13) months after the effective date of the Contract.

Each ten (10) sets of the completed manuals in English and Mongolia shall be submitted by the Suppliers of Package-1 and Package-2 within twenty (20) months after the effective date of the Contract.

(9) Maintenance Manuals

The Supplier shall submit maintenance manuals for all the Goods supplied in this Contract.

Two (2) sets of draft of the manuals shall be submitted for review of the Purchaser within nineteen (19) months after the effective date of the Contract.

Each ten (10) sets of the completed manuals in English and Mongolia shall be submitted within twenty-seven (27) months after the effective of the Contract.

For each equipment supplied under this Contract, the following shall be developed:

- Procedure covering preventive maintenance of the specific detail of equipment.
- Detailed dismantling and assembling procedures
- Checks and tests prior to returning the equipment to service.
- Detailed assembly drawings and illustrations including parts lists and numbers for replacement ordering.
- Setting and running clearances and tolerances.
- Cleaning and preservation procedures.
- A preventative maintenance schedule for all the Goods.
- A lubrication schedule showing requirements and specifications for all the Goods.
- Printed circuit board schematics and module schematics.
- Detailed drawings and method for use of special maintenance tools.
- List of recommended spare parts and list of consumables
- Troubleshooting guide.
- Trade name or standard name of materials (lube oil, welding rod and wearing metal) that are available in Mongolia to those supplied under this contract.

6. PATENTS, TRADE MARKS

(1) The Goods may bear patent numbers, trade marks or trade names in English of each one of the suppliers thereof.
Nothing contained herein shall be construed as transferring any patent or trademark rights or copyrights in such Goods, and all such rights are hereby expressly reserved to the true and lawful owners thereof. No copyright for drawings and documents of the Project in any case can be transferred to the Purchaser.

(2) The Supplier shall defend the Purchaser and hold harmless the Purchaser from patent liability or claim of patent infringement of any nature or kind, including costs and expenses for, or on account of, any patent or unpatented invention made or used in such Goods, including the costs and expenses of litigation, if any.

7. APPLICABLE STANDARD AND UNITS OF MEASUREMENT

(1) Applicable standard

Unless otherwise specified in the Specification, all the Goods shall conform to the latest edition to one of the following codes and standards or equivalent.

(a) Japanese standards

JIS - Japan Industrial Standards
JEC - Standards of the Japanese Electro-technical Committee
JEM - Standards of Japan Electrical Manufacturer's Association
JCS - Japanese Cable Maker's Association Standards

(b) U.S.A. standards

ASME - American Standards of Mechanical Engineers
ANSI - American National Standard Institute
ASTM - American Society for Testing and Goods
ISA - Instrument Society of America
MSS - Manufacturers Standardization Society of the Valve and Fitting Industry
NEMA - National Electrical Manufacturers Association
NFPA - National Fire Protection Association
IEEE - Institute of Electrical and Electronics Engineers
OSHA - Occupational, Safety and Health Act
NEC - National Electric Code
UL - Underwriters Laboratories

(c) International standards

ISO - International Organization for Standardization
IEC - International Electro-Technical Commission

(2) Units of measurement

Weights and measures shall be given in the metric system and the following symbols shall be used for the drawings and documents submitted by the Supplier.

mm	:	milimetre
cm	:	centimetre
m	:	metre
km	:	kilometre

cm^2	:	square centimetre
cm^3	:	cubic centimetre
kg	:	kilogram
kgf	:	kilogram force
kgf/cm^2	:	kilogram force per square centimetre
t	:	metric ton (1,000 kilogram)
sec.	:	second
m/s	:	metre per second
A	:	ampere
V	:	volt
kV	:	kilovolt
kVA	:	kilovolt-ampere
MVA	:	megavolt-ampere
kW	:	kilowatt
MW	:	megawatt
MWH	:	megawatt-hour
N-m	:	Newton-meter
ppm	:	Parts per million
Micro-S	:	Micro-Siemens
℃	:	degree Celsius
rpm	:	revolution per minute
Hz	:	hertz
g/kW-h	:	gram per kilowatt-hour
kcal/kg	:	kilocalorie per kilogram
%	:	per cent

8. SHIPPING INSTRUCTION

(1) Packing

All the Goods shall be packed and then containerized along all the routes to Mongolia, unless otherwise specified.

The Supplier shall take suitable precaution for the packing of the Goods to ensure safe handling during the transportation up to the Site.

The packing shall be sufficiently strong to avoid loss or damage and adequately sealed for cold weather condition so that each item will be kept serviceable at least sixty (60) days after the arrival thereof at the Site.

Precaution shall be taken to protect shafts and journals where they rest on wooden or other supports likely to contain moisture. At such points, wrapping impregnated with anti-rust composition, to avoid chafing and indentation due to movement which is likely to occur in transport, shall be used and be suitable for at least ninety (90) days.

Woodwool shall be avoided as far as possible. Straw packing shall be prohibited.

Wooden boxes for export packing shall fulfil the requirements of JIS-Z-1402, 1403 and 1405 or equivalent.

All stencil marks on the outside of casings shall be either of waterproof materials or protected by shellac or varnish to prevent erasure in transport.

Where practicable, all indoor items damageable by moisture such as instruments and panels, machine components, etc., shall be covered in polyethylene sheet, sealed at the joints and the enclosure provided internally with an appropriate desiccant. In addition, for the Goods of less durability to low temperature shall be fully insulated.

All items of the Goods shall be clearly marked for easy identification on the packing. The container shall each contain a list of packages included in it on the outside, and shall bear an identification mark relating them to the appropriate shipping documents.

All packages shall be clearly marked on the outside to show where the weight is concentrated and the correct position of the slings.

If the Supplier ships dangerous goods as defined in the International Maritime Organization (IMO) code, he shall pack them in accordance with the authorized rules issued by the organization of the Supplier's country or equal to "Rules for the Carriage and Storage of Dangerous Goods in Ships" issued by the Ministry of Transportation of Japan and shall submit the following documents two (2) weeks prior to cargos becoming available for shipment, with one (1) copy to the Purchaser.

(a) Advance notice of dangerous goods to the Port Authority (4 copies)

(b) Declaration of dangerous goods to a shipping company (4 copies)

Any items not stipulated herein shall be according to the Supplier's Standard of export packing for cold weather condition.

(2) Packing List and Container Stuffing List

Each container shall have a copy of packing list for the packages contained which shall be covered in a waterproof envelope and be placed outside of the container. The packing list shall give all informations on the package, such as package number, packing appearance, net weight, gross weight, dimension, measurement, name of the Site (4th Thermal Power Plant, Ulaanbaatar, Mongolia) and description of Goods which is contained in each package.

In case that the containers having serial numbers of packages are contained, the master packing list shall be placed inside the container which has the lowest package number.

The Supplier shall submit for each delivery the Container Stuffing List indicating the numbers of packages in each container.

(3) Marking

(a) Each package shall be clearly marked on two (2) sides in black with a stencil and water proof ink or oil paints by means of block letters not less than 30 mm high as follows:

The marking for each package shall be of Supplier's standard.

CONSIGNEE : The 4th Power Plant in Ulaanbaatar, Mongolia
PROJECT : Rehabilitation Project of the 4th Power Plant (Phase-II)
LOAN NO. : JBIC Loan MON – P6
DESCRIPTION OF CONTENTS :
PORT OF SHIPMENT :
NET WEIGHT : (kg)
GROSS WEIGHT : (kg)
DIMENSION : (L) x (W) x (H) (cm)
PACKAGE SERIAL NO. :
SUPPLIER :

These marks shall be protected against weather by clear water-resistance varnish.

(b) Bags, bundles, other packages and loose pieces, which cannot practically be marked as aforesaid, shall have two metal labels securely fastened thereto by wire, and each label shall be stamped or printed with the above markings.

9. SHIPMENT, INLAND TRANSPORTATION AND STORAGE

(1) The Supplier shall, on his responsibility and at his own cost, ship, transport and unload all the Goods to the Site.

(2) The Supplier shall, on his responsibility and his cost, send the documents specified in Section II Clause 9 to the Purchaser upon shipment one week before arrival of the Goods.

(3) The Supplier shall notify the Purchaser of the following information by fax upon shipment.

(a) Loan agreement (with JBIC) Number and Project Name.
(b) Items Shipped.
(c) Name of Company Responsible for all Transport.
(d) Number of Packages and Containers Shipped.
(e) Name of Ship and Train Number for the place at the border.
(f) Name of Shipping Company and its Agent in Mongolia and other country if any.
(g) Bill of Lading Number.
(h) Port of loading in the country of the Supplier and Expected Date of Arrival in China or Russia.
(i) Date of Shipment in the country of the Supplier and in China or Russia.
(j) Expected Date and Place of Arrival at the Border and Ulaanbaatar.
(k) Total Gross Weight and Measurement of Each Container Shipped.

(4) The Supplier shall be responsible for clearance of all Goods supplied under the Contract. The Supplier shall submit to the Purchaser six (6) copies of bills of lading of the Goods immediately after the customs clearance.

(5) The Supplier shall observe all regulations which limit loads on wharves, rails, and roads over which the Goods will be transported. The handling and storage of any Goods supplied under the Contract during transportation thereof shall be at the risk of the Supplier and without responsibility to the Purchaser.

(6) Inspection of the Goods

(a) Upon arrival of the Goods, the Supplier shall unpack, check and inspect them for verification of loss, shortage and/or damage, at the presence of the Purchaser.

(b) The Purchaser and Supplier shall sign the checklist to be prepared by the Supplier.

(c) If loss, shortage or damage of any Goods is found in the packages, the Supplier shall forthwith supply a substitute of the Goods on his account to the checklist thus mutually signed.

(7) Storage and Keeping of the Goods

The Purchaser shall supply indoor/outdoor storage area and the bridge crane free of charge. The Supplier shall be responsible for handling, keeping the Goods in the warehouse and handing over the Goods to the erection Contractor under control of the Purchaser.

According to the erection schedule, the erection Contractor will give a notice prior to receiving the Goods from the Supplier. List of the Goods handed over to the erection Contractor should be provided by the Supplier to the Purchaser.

10. NAME PLATE AND CAUTION PLATE

Name plates of all panels, equipment and/or related instruments shall be indicative with English language. However, Caution plates shall be indicative with Mongolian language by Cyritic alphabet.

Such Mongolian language shall be translated by the Supplier on Supplier's account.

11. TECHNICAL REQUIREMENT

11.1 General

Unless otherwise specified, all the Goods shall comply with the requirement hereunder described.

11.1.1 Quality

(1) All the Goods to be used for the Project shall be new, unused, free of any defect in quality and workmanship, and of first-class quality in strength, reliability and other necessary features.
Any defect and imperfection will not be acceptable.

(2) The inspection of the Goods or the waiving of the inspection thereof shall in no way relieve the Supplier of the responsibility for furnishing the Goods meeting all the requirements of the Specification. For all the Goods supplied, except otherwise specified in the Specification, name of manufacturer and country of origin shall be clarified in the Technical Schedules of the Bids.

11.1.2 Site Condition

(1) Meteorological Condition in Ulaanbaatar
The Supplier shall comply with following meteorological Condition.

(a)	Temperature (mean)	Maximum	:	+30 ℃
		Minimum	:	−30 ℃
(b)	Relative humidity (mean)	Maximum	:	90 %
		Minimum	:	30 %
(c)	Monthly precipitation	Maximum	:	80 mm
		Minimum	:	2 mm
(d)	Elevation		:	1,350 meters above sea level

11.1.3 Common Specification to all Goods

(1) Durability under cold/hot temperature
Site conditions specified herein shall be considered in the selection of the Goods.

As the minimum/maximum mean temperature would be assumed minus 30℃/plus 30℃, valves, pipes etc. to be installed shall be subject to even minus 40℃ during short hours in winter.
Especially, grease, oil and sealing materials shall function even in such cold period.

(2) Co-operate with the Purchaser and the Package-2 supplier to ensure proper matching of design, manufacture, supply, commissioning and trial run.

(3) The surface of the Goods shall be cleaned and be painted at each factory before shipping. For equipment being painted, the Supplier must ensure the favorable conditions of cleanliness. Required color shade shall be approved by the Purchaser. The paint materials consider temperature of inside fluid.

11.1.4 Goods and Services Supplied by the other Supplier

Following Suppliers/Contractor shall cooperate each other in implementation of this Rehabilitation Project.

Package-1 Supplier : Conversion of firing system for boiler No.5 to No.8

Package-2 Supplier : Rehabilitation of C&I for boiler No.5 to No.8

Package-3 Supplier : Replacement of boiler tubes for boiler No.5 to No.8

Package-4 Supplier : Replacement of exciter for generator No.1 to No.4

Package-5 Contractor : Erection work for the Goods supplied by Package-1 to Package-4

11.2 Common Specification to Mechanical Equipment & Civil work

11.2.1 Mechanical Component

(1) Raw materials shall conform to the latest JIS or ASTM standards, unless otherwise specified.
All screws, nuts, bolts and other threaded parts shall conform to ISO or JIS standards, while all piping material such as pipes, valves, flanges, fittings and others shall conform to JIS or ANSI standards.
For the other material and equipment, see Clause 7(1) Applicable standard.

(2) Castings and Ceramics sintering

All castings or sintering shall be true to pattern, of workmanlike finish, of uniform quality and conditions, free from blowhole, hard spot, shrinkage, defect, crack, or other injurious defect, and shall be satisfactorily cleaned for their intended purpose. The surface shall be free from irregularities, such as projections, ridges, hollows, honeycombs, etc.

The structures shall be homogeneous and free from excessive non-metallic inclusions. An excessive segregation of impurities will be a cause for its rejection.

Cast iron shall be avoided as much as possible, because it is difficult material for welding during maintenance service.

(3) Forgings

All forgings shall be in accordance with appropriate JIS or ASTM standards. Alloy forgings shall have physical properties at least equal to those required by JIS or ASTM specifications.

Any tool mark or tearing of the metal on the surface of fillets by the finishing tool will not be permitted.

Grinding or polishing shall be required to remove such marks if they occur. All finished forging surfaces shall be smooth and free from tool marks.

(4) Insulation and Lagging

The Supplier shall furnish insulation for all piping, ducting and equipment which could have a surface temperature of 50℃ or higher.

Asbestos shall not be used.

The design value of radiated heat for insulation material shall be follows:

(a) Radiated heat Not more than 200 kcal/m²h

(b) Difference between surface temperature of insulation material and ambient temperature

Equipment and Pipe Temperature	Temperature Difference
300℃ and higher	20℃max.
200℃ ~ 300℃	15℃max.
Under 200℃	10℃max.

(Ambient temperature: air temperature at place 500mm distant perpendicularly from heat radiating surface)

(5) Noise Level

Sound level shall not exceed 90 dB(A) at a distance of one(1) meter from all surfaces of the equipment.

11.2.2 Bearing

(1) Grease, Oil and Packing

These shall be as common as possible for all the Goods.

(2) All bearings and gear couplings shall be of dust proof.

(3) All bearings shall be sealed against loss of lubricant.

11.2.2 Motor Operated Valves (dampers)

All of the motor operated valves (dampers) supplied for the Works shall be used of 380 VAC, 3 ϕ power supply from LV switchgears. The motor operated valves (dampers) for the direct firing system such as mill pyrite box inlet valve, PC pipes stop valves, secondary air dampers, PGF outlet dampers shall be supplied by the Package-1 Supplier.

The Supplier shall provide a list of motor operated valves (dampers) for the direct firing system in the Technical Schedules.

11.2.3 Fire Protection

(1) The direct firing system shall be designed in accordance with the recommendations of the National Fire Protection Association Standards, 8503 and 69, so that it may prevent pulverized coal from fire.

(2) The Supplier shall describe the type of fire detection and protection system to be provided for the direct firing system in the Technical Schedules.

11.2.4 Foundation Work

(1) Foundations of all the Goods shall be designed by the Supplier. Dynamic load shall be taken into consideration for design of the foundation of rotating machines.

The Supplier shall investigate the area at where the Goods will be located before commencement of the foundation design.

The method how to remove the existing equipment and foundation shall be also studied by the Supplier.

(2) The Supplier shall provide foundation bolts, nuts and templates necessary for the foundation of the Goods.

11.3 Design Condition of Direct Firing System

All equipment in the direct firing system shall be designed based on the following conditions.

(1) The system shall be designed in accordance with the design conditions described in the attached Table TS-1-01.

(2) The coal characteristics shown in Table TS-1-02 are for bidding purpose only, the Supplier shall analyze the coal characteristics in advance and design the Goods based on the analyzed characteristics after getting confirmation of the Purchaser.

The Supplier shall take sample coal for analysis in accordance with International Standards under the purchaser's supervision.

(3) The pulverizer shall be designed for the firing with coal Baganuur and Shivee-Ovoo, each 100%.

(4) The capacity of the pulverizer shall meet the requirements for 115% of boiler MCR (Maximum Continuous Rating: 420 t/h) with four(4) pulverizers in operation.

(5) Select internal pressure after studying mass balance, heat balance and state the selected internal pressure including the direct firing system.

(6) Basically independent pre-drying provisions should not be installed for high moisture coal, specified in the table. If pre-drying required from construction of the pulverizer necessary provisions may be included.

(7) Furnace outlet gas (800~950℃) and recirculation gas (140℃) should be used as drying and transfer medium.

(8) Flue gas/pulverized coal velocity at coal burner throat is designed to be same speed as that of existing burner of 24.5m/sec.

The Supplier shall re-check the value to design the speed.

(9) For pulverized coal pipes, pressure balance shall be examined sufficiently by the Supplier so that flow unbalance will be kept at minimum among corners and elevations at burners.

(10) Adequate provisions against wear should be provided for coal pulverizers, coal chute, pulverized coal pipe and primary gas fans.

(11) All wearing parts shall be arranged for easy replacement with minimum dismantling of the pulverizer. Sections subject to abrasion shall be provided with readily replaceable parts of ceramic tile lining or its equivalent, hard and wear resistant material.

(12) The guaranteed life of the wearing parts of the pulverizer shall not be less than 6,000 operating hours. The wear shall be measured and the life shall be estimated by the Supplier after first 6,000 hours operation.

(13) Vibration of pulverizers and primary gas fans shall be kept within 50μ (peak to peak) under specified coal range.

(14) Heat resistant material should be selected under the condition of a gas temperature based on maximum moisture coal.

(15) Average spillage quantity of coal shall be less than 0.1% of the total coal flow within pulverizer under stable operation at full load.

(16) Construction and arrangement shall be determined so as to be easy to remove, maintain, repair and adjust.

(17) Anti-explosion design of the pulverized coal system shall be subject to internal anti-explosion pressure.

(18) The system shall be so designed as to avoid coal stoppage, especially in case of high moisture, which contains considerable fines resulting in a sticky material that arches over bunker outlets, rat-holes through bunkers and downspouts.

(19) The monitoring of the proposed direct firing system shall be designed in consideration of the followings.

(a) to detect the development of an arch of the absence of coal

(b) to detect internal fire

(20) Platform, hand-rails and steps shall be provided for maintenance of the pulverizers, primary gas fans and dampers.

(21) Concept of control for the direct firing system

All equipment for the direct firing system shall be operated by the automatic control system, which is supplied by the Supplier of Package-2, at the existing CCR. The control system has auto and remote manual operations, and shall include necessary signals from the direct firing system. In addition, emergency stop switches (manually operated at the local) shall also be provided for the following equipment:

- Pulverizer
- Coal Feeder
- Primary Gas Fan

Table TS-1- 01 Pulverizer Design Condition (reference for Bid) *1)

Boiler Load	MCR	MCR	MCR
Coal mine	Design Coal*2)	Baganuur	Shivee-Ovoo
Quantity of pulverizer in operation	4	4	4
HGI	50	50	64
Fineness	35% retained on 90 micron sieve (40% retained on 200 mesh sieve)		
Coal rank	Brown coal	Brown coal	Brown Coal
Total moisture at pulverizer inlet (%)	39.0	33.0	39.0
Total moisture at pulverizer outlet (%)	12.0	12.0	12.0
Gas temperature at pulverizer outlet (°C)	80 (possibility 70~105°C)		
Pulverizer maximum capacity*3) (kg/h)			
Coal consumption per pulverizer (kg/h)	27,500	27,500	
Pulverizer load*4) (%)			
Power consumption per pulverizer/primary gas fans and seal air fans*5) (KW)			
Noise db (A) (at 1.0m from the pulverizer)*6)	<90	<90	<90

MCR* Maximum continuous rating, 420 t/h load

*1) The Supplier shall analyze the Coal Characteristics in advance.

*2) Design coal : For reference

*3), *4), *5), *6) : This shall be determined by the Supplier, in accordance with design condition

*4) Capacity decrease due to erosion of wearing parts after 6,000 hrs operation shall be taken into consideration

*5) Main motor input

Table TS-1- 02 Coal Characteristics for the Project (reference for Bid) *1)

Coal mine			Baganuur		Shivee-Ovoo	
			Mean	Range	Mean	Range
Proximate Analysis						
Volatile matter		%	42	39~45	45	36~48
Fixed carbon		%	32	30~40	31	28~36
Ash		%	15	13~18	16	12~18
Moisture (Inherent)		%	11	8~13	8	3~12
			100%		100%	
Total moisture as-received basis		%	33	30~40	39	37~44
Calorific value as-received basis (dry)		Kcal/kg	3,250	2,600~3,500	2,900	2,700~3,400
Grindability-Hardgrove*2)		-	50	40~60	64	62~66
Ultimate Analysis						
Carbon		%	73.2		72.89	
Sulfur		%	0.6	0.4~0.8	0.61	0.6~0.9
Hydrogen		%	4.7		4.19	
Oxygen		%	20.6		21.38	
Nitrogen		%	0.9		0.93	
			100%		100%	
Ash Analysis						
SiO_2		%	54.8		44.44	
Al_2O_3		%	12.5		14.51	
Fe_2O_3		%	10		8.03	
CaO		%	12		15.24	
TiO_2		%	0.6		0.64	
MgO		%	1.8		3.96	
MnO		%	-		-	
SO_3		%	6.4		10.87	
P_2O_5		%	-		-	
Na_2O		%	0.6		0.81	
K_2O		%	1.3		1.5	
			100%		100%	
Pulverized coal (Project)	Moisture	%	12			
	Fineness	-	35% retained on 90 micron sieve (40% retained on 200 mesh sieve)			

*1) The Supplier shall analyze the Coal Characteristics in advance.

*2) Grindability Index in accordance with ASTM Standard D 409.

11.4 Direct Firing System

11.4.1 Pulverizer

The essential parameters for design of the pulverizer are as follows:

(1)	Quantity	:	Four(4) sets per one(1) boiler
(2)	Type	:	Positive type , vertical bowl mill
(3)	Capacity	:	More than 27,500 kg/h/mill Capacity of pulverizer shall be determined by the Supplier in accordance with the design conditions
(4)	Pulverized coal fineness	:	35% retained on90micron sieve (40% retained on200 mesh sieve)
(5)	Turn down ratio	:	All of the following conditions shall be satisfied. 1) (Minimum capable coal feed rate)/(maximum capacity): less than 50% 2) 43% MCR of the boiler load with two(2) pulverizers in operation shall be established with specified coals (Approx. coal consumption at design coal: 23,650 kg/h/mil)
(6)	Coal property	:	Refer to the attached table TS-1-02
(7)	Gas temperature at pulverizer outlet	:	80°C for design coal (Adjustable to 70~105°C)
(8)	Gear reducer	:	Separate removal type
(9)	Lubrication system	:	External lubrication
(10)	Roller or other grinding element loading system	:	Spring

The following matters shall also be included in the design of the pulverizer:

(1) The performance of the pulverizer specified in the attached table TS-1-01 should be tested after first 6,000 hours operation.

(2) Turn-down of the pulverizer shall be wide and free of deterioration.

(3) Rapid response of pulverized coal feed shall be secured under boiler load fluctuation.

(4) Each pulverizer shall be capable of withstanding the tripping and the running down from full load to stop.

(5) Low power consumption will be preferred. Power demand curves shall be provided, covering conditions for an empty pulverizer, a pulverizer at maximum output and a blocked pulverizer with the specified coal.

(6) The pulverizer shall use a direct drive through a separate removal type gearbox, provided with internal classifiers with fineness adjustments made externally.

(7) Low to medium speed pulverizer, which apply crushing load through bearings and not through metal to metal contact are preferred.

(8) Clearance shall be kept in any time at grinding region.

(9) The pulverizer shall be of such construction that adjustment can be easily made for performance related to fineness.

(10) The pulverizer shall be of such construction that metal pieces and other foreign matter in coal can be easily tapped and removed during operation.

(11) To achieve more than 6,000 hours of life time, high grade overlay shall be applied on grinding surface. Too much volume of foreign materials in coal (such as stone, metal etc.) shall also be considered.

(12) The pulverizer shall be of such construction that the vibration caused by pulverizing will be kept at minimum and shall have a sufficient strength and rigidity to prevent cracks from occurring.

(13) Lubrication of all bearings and other moving parts shall be continuous and automatic from a cooled and filtered lubricating oil system.

(14) An arrangement of dampers shall be provided to fully isolate each pulverizer from flue gas for maintenance purpose.

(15) A remotely controlled steam inerting system for each pulverizer shall be provided, to inert the pulverizers prior to start-up and after shutdown.

(16) All inerting steam pipes and motor operated valves shall be provided.

(17) All flange mountings, bolted casing sections and doors shall be template drilled to ensure interchangeability.

(18) It is preferable to install new pulverizers on the existing area. (refer to Dwg.MON-K-1-05)

(19) Ample distance between coal feeder outlet and pulverizer inlet, and between pulverizers shall be secured.

11.4.2 Coal Feeder

(1) Each pulverizer shall have a separate feeder of gravimetric belt type to regulate the coal flow under control by the combustion control system.

The coal flow shall be regulated in a continuous manner and not in an "on-off" manner.

(2) The feeder shall include a local indication of the coal flow rate, a totalizer showing the total coal passed and a rate of flow signal for use in the monitoring and control system. The accuracy shall be better than ± 1.0%.

(3) The feeder shall have means to initiate alarm and/or trip signal in the event of being no coal on the feeder belt or stoppage of flow due to blockage or belt slippage.

11.4.3 Primary Gas Fan

(1) Rated flow and delivery pressure of the fan shall be determined considering:

- Shivee-Ovoo coal moisture content : max 44%
  Calorific Value (dry) : 2,900kcal/kg
- Ample margin to follow the boiler load variation

(2) The primary gas fan shall be capable of withstanding a flue gas temperature of expected 400~500°C.

(3) The rotor and casing shall be constructed of wear resistant material to attain more than 6,000 operation hours without any repair work.

(4) A control drive for the flow control damper inlet to the fan will be provided by the package-2 Supplier.

(5) An on-off damper with a motor drive mechanism shall be provided at outlet of the fan.

(6) Following gauges shall be provided:

- vibration monitoring system
- bearing thermometers
- thermo-couples for bearing temperature

11.4.4 Seal Air Fan

(1) Rated flow and delivery pressure of the fan shall be determined so that each fan can supply sufficient seal air to the corresponding pulverizer and coal feeder with an ample design margin.

(2) Provisions shall be provided to adjust air flow to the necessary parts of the pulverizer.

(3) At inlet to the fan, the air filter shall be provided.

11.4.5 Raw Coal Bunker

(1) The Supplier shall modify the lower part of the existing coal bunker to supply coal for two(2) coal feeders (from one(1) raw coal bunker).

(2) One(1) gate valve shall be provided for each feeder.

(3) Provisions to exhaust coal from the bunker after running down of the boiler shall be provided and stated in the Technical Schedules of the Bids.

(4) Supply scope shall be referred to Dwg.MON-K-1-08.

11.4.6 Coal Chute

(1) The coal chute shall be constructed of round stainless steel pipes, fitted with bolts.

(2) Provisions for drying coal in the coal chute shall be installed to attain better performance of the pulverizer.

(3) Location of the pulverizer shall be determined so that the coal chute has no bend portion as possible, if inevitable the bended area shall be internally lined with ceramic material by way of erosion attack prevention.

11.4.7 Hot and Cold Gas Duct

(1) Connection of the ducts with equipment (pulverizer, primary gas fan, damper, expansion joint etc.) shall be by way of bolting for easier maintenance work. Lifting tag shall be provided for maintenance.

(2) These ducts shall be made of heat resistant steel with the necessary flanges, outside stiffenings, connection frames.

(3) The sampling hole on the duct shall be fitted with a blind plate by bolting.

(4) Terminal point of supply
- Cold gas duct : FL + 10.0m (refer to Dwg. MON-K-0-07)
- Hot gas duct : FL + 14.0m (refer to Dwg. MON-K-0-07)

Dampers and expansion joints shall be included.

(5) Option

The Supplier shall quote the following three(3) items in his Bids as option:

(a) Cold gas duct for #5 & #6 boiler : Complete replacement of cold gas duct.

(refer to Dwg. MON-K-0-19)

(b) Hot gas duct for each boiler : Complete replacement of hot gas duct with refractory.

(refer to Dwg. MON-K-0-21)

(c) Ash collector before inlet of PGF (Ash removal efficiency of ash collector shall be more than 90%).

11.4.8 Pulverized Coal Pipe

(1) Pulverized coal pipes from the pulverizer to the coal burner, including a damper, orifice and expansion joints shall be provided.

(2) The bend of the pulverized coal pipe shall be internally lined with ceramic tile, if the deviation from the straight is more than 30°.

(3) The sampling hole on the pulverized coal pipe shall be fitted with a blind plate by bolting.

(4) Terminal point of supply
- Pulverized coal line : coal burner inlet.

11.4.9 Burner

The coal burner to be replaced with existing one which is the fixed, horizontal and corner firing type consists of 4 x 3 stage burners shall be designed based on the design conditions specified in clause 11.3 and followings:

(1) Coal characteristics : design coal

(2) Fuel coal speed at burner throat : 24.5m/sec.

(3) Coal fineness : 35% retained on 90 micron sieve
(40% retained on 200 mesh sieve)

(4) The construction of the coal burner shall be designed that any clinker trouble on the furnace wall and the burner does not occur.

(5) Supplier shall design so that there is minimum unbalance of pulverized coal flow among furnace corners and burner elevations.

(6) NOx content in burned gas shall be decreased as much as possible.

11.4.10 ALTERNATIVE

The Bidder may propose the following alternative that differs substantially from the Specifications:

Type of pulverizer : negative pressure type instead of positive pressure type.

Note: Exhausters shall be included for this alternative.

11.5 Electrical Equipment

11.5.1 General

(1) All electrical equipment and materials shall comply with the requirements of this Bidding Document and conform to latest applicable standard publications of International Electro-technical Commission (IEC) or equivalent standards. In case of a conflict between IEC and other standards, the requirement of IEC shall govern. Whereas specifications stated in this Bidding Document shall have precedence over all these standards.

(2) Power supply
The electric power sources in the 4th Thermal Power Plant are as follows:

(a) AC source
- Voltage : 6,000V, 380V, Three (3) phase or 220V, Single phase, 50Hz
- Voltage fluctuation : - 5%, + 10%
- Frequency fluctuation : ± 5%

(b) DC source
- Voltage : 220V

(c) All electrical sockets available are of European style.

(d) Compressed air for instrumentation is not available.

(3) Design ambient temperature for all electrical equipment.
- maximum : + 40℃
- minimum : - 10℃

(4) The sensitive relay and other electrical and electronic devices shall be located in control room, electronic equipment room, local panel, and etc.

(5) Unless otherwise stated, the enclosure of electrical equipment, which are located in the electrical switchgear room and in the control room shall be dust-tight, vermin proof, conforming to degree of protection IP-4X. Equipment located in the other areas shall have enclosure conforming to degree of protection IP-54 or higher degree.

(6) The equipment enclosure, intended for outdoor service, shall be of weather-proof construction, conforming to degree of protection IP-55.

11.5.2 HV and LV Motors

(1) Technical Requirement

All High voltage (HV) and Low voltage (LV) motors shall have following requirement, but not limited to.

(a) Rated voltage of motors shall be selected from the following criteria:
- 200 kW and larger : 6.0 kV
- less than 200kW : 380 V

(b) All motors shall have torque characteristics suitable for the driven load, and shall be able to start fully loaded and to accelerate their connected loads to rated speed with only the minimum percent of motor rated voltage at the terminals. Approved AC motors shall be three phase cage induction type with a rated speed not exceeding 1,500 rpm.

(c) All motors shall be rated for the load and duty cycle of the intended service.

(d) The types and sizes of motor shall be selected to minimize the power consumption.

(e) All HV motors shall be provided with the space heater.

(f) Degree of protection shall be increased for motors located in the hazardous area.

(2) Specifications for HV Motors

All high voltage (HV) motors shall be designed based on the following specifications, but not limited to.

(a)	Applicable Standards	IEC-34, JEC-37
(b)	Type	Single speed, squirrel-cage induction
(c)	Enclosure	IP 54
(d)	Cooling	IC 411, totally enclosed, surface cooled by fan (if necessary)
(e)	Rated Voltage	6.0 kV
(f)	Phases	3-phases
(g)	Frequency	50 Hz

(h)	Ambient Temperature Max	+40 ℃
(i)	Insulation	F class
(j)	Temperature Rise	according to class B
(k)	Time Rating	S1 continuously running
(l)	Direction of Rotation	CW, right, according to required fan and/or pump
(m)	Terminal Box	totally enclosed
(n)	Space Heater	anti-condensate heating type AC230V
(o)	Thermocouple in Stator Winding	Motor stator temperature shall be monitored
(p)	Bearing Type	Anti-friction bearings
(q)	Lubricant Type and Quantity	Lithium based grease (e.g. shell alvania or equivalent)
(r)	Noise Level	85 dB (A) or less

(3) Specifications for LV Motors

All low voltage (LV) motors shall be designed based on the following specifications, but not limited to.

(a)	Applicable Standards	IEC-34, JEC-37
(b)	Type	Single speed, squirrel-cage induction
(c)	Enclosure	IP 54
(d)	Cooling	IC 411, totally enclosed, surface cooled by fan (if necessary)
(e)	Rated Voltage	380V
(f)	Phases	3-phases
(g)	Frequency	50 Hz
(h)	Ambient Temperature Max	+40 ℃
(i)	Insulation	F class
(j)	Temperature Rise	according to class B
(k)	Time rating	S1 continuously running except the damper drive motor

(l)	Direction of Rotation	CW, right, according to required fan and/or pump
(m)	Terminal Box	totally enclosed
(n)	Noise Level	85 dB (A) or less

11.5.3 HV and LV Switchgears

(1) Technical Requirement

All High voltage (HV) and Low voltage (LV) switchgears shall consist of:

- 7.2 kV metal clad switchgears for motors of 200 kW and above.
- 460 V power centers for motors of 80 kW and less than 200 kW.
- 460 V motor control center for motors of less than 80 kW.

According to the above criteria, 7.2 kV metal clad switchgears shall be met for PGF and Mill motors. Also 460 V motor control center will be met for the other motors.

Further all switchgears shall comply with the following requirement, but not limited to.

(a) Switchgears shall be free-standing, vertical, cubicle/panel type, completely wired, having access doors with concealed hinges and locking type latches.

(b) Panels shall be fabricated of minimum 2 mm. thick CRCA (cold rolled continuously annealed sheet steel, free from any surface imperfections and suitably reinforced to provide a sturdy and rigid assembly.

(c) Panels shall be adequately sized for installation of field cables and be accessible for maintenance.

(d) Each panel shall be provided with internal illumination lamp operated by a door switch, a space heater with fuse unit (protection devices), and a plug socket with a switch for a hand lamp.

(e) All instruments, switches etc. mounted on the front surface of the panels.

(f) Protection devices for metal clad switchgears shall be based on the microprocessor that allows followings:

- necessary protection (49, 50, 51, 67 and etc)
- monitoring the parameters
- set point adjustment
- historical records

(g) Protection devices for the prevention of the motor contribution due to a short period of power failure (interruption of a breaking in the power supply) shall be required to the necessary feeders for metal clad swithgear.

(h) Protection devices for the prevention of contactor open due to a momentary voltage dip shall be required to the necessary feeders of motor control center.

(i) All equipment and devices shall be mounted that removal and replacement may be accomplished individually without interruption to the other equipment and devices in service. Adequate ventilation shall be provided for the enclosed panel.

(j) One (1) spare feeder of each type shall be provided for the motor control center of each boiler Unit.

(k) All panels shall be completely wired at the factory to ensure proper functioning of all control, protection and interlock schemes. All wiring necessary for external connection shall be brought to terminal blocks and numbered.

(l) Wiring cable in the panel shall be of flexible, heat resistant, 650V grade, PVC insulated stranded copper wire.

(m) Solderless compression/clamp type connections shall be used for wire terminals. Wiring shall be continuous between terminals without splicing. Each wire shall be identified at both ends with permanent markers having a wire number as per approved wiring drawings.

(n) Terminal blocks shall be box clamp type with marking strip. Not more than two wires shall be connected to one terminal. Spare terminals equal in number to 20 % of active terminals shall be furnished.

(o) A ground bus shall be copper bar which run along the entire length of panel structure and shall have a terminal connector at each end for connection to the station ground grid.

(p) All metal surface of the panel shall be cleaned, phosphated and given two coats of rust-resistant primer followed by two coats of finish paint. Required color shade shall be approved by the Purchaser.

(q) The Supplier shall verify connection between new and existing metal clad switchgears. The Supplier shall investigate the installation place and spaces before the designing and fit the new switchgears to the place designated by the

Purchaser. Further typical arrangement of the swithgears is attached in the drawing MON-K-1-24.

(r) New switchgear room specified in Clause 12.1 (3) (c) shall comply the safety standard and shall be equipped with necessary accessories such as illumination, ventilation, plug, fire-fighting tool etc. The Supplier shall investigate the installation place and allowable size for the new switchgear room designated by the Purchaser.

(2) Specification for Metal Clad Switchgears

7.2 kV switchgears shall be factory assembled, metal-clad cubicle for indoor installation. Following compartments shall be provided inside the cubicle:

(a) Circuit breaker compartment including a withdrawable circuit breaker (vacuum type)

(b) Busbar compartment with three-phase busbar system

(c) Cable connection compartment with firmly installed current or voltage transformers, earthing switches, surge arrestors and cable terminations.

The cubicle partition panel shall be made of steel sheet, but the partition panel for the busbar an insulating plate. The busbar shall be made of high-quality electrolytic flat bare copper. The high-voltage switchgear shall be constructed according to the following specifications:

(a)	Applicable standards	IEC-56, JEC-2300, VDE 0670
(b)	Design ambient temperature	+40 ℃
(c)	Relative humidity	90 %
(d)	Rated voltage	7.2kV
(e)	Number of phase	3phase 3wire
(f)	Neutral	earthed through a resister at existing 6kV bus bar, 5A
(g)	Rated frequency	50Hz
(h)	Rated current of main busbar	* A
(i)	Rated interrupting current	* kA
(j)	Rated short-time withstand current	31.5 kA, 1 sec
(k)	Impulse withstand voltage	

- to earth parts and pole to pole * kV
- across the open break * kV

(l) Power frequency withstand voltage 1min/50 Hz
- to earth parts and pole to pole * kV
- across the open break * kV
- auxiliary circuit * kV

(m) Degree of protection IP 4X

Note) *To be determined by the Supplier and subject to the Purchaser's approval

(3) Specification for LV Switchgears

The Supplier shall supply the motor control center and accessories with the following electrical characteristics, but not limited to.

(a)	Design ambient temperature	+40℃
(b)	Relative humidity	90%
(c)	Nominal operating voltage	400 V
(d)	Rated voltage	460 V
(e)	Number of phase	3 phase 3 wire
(f)	Neutral	deadly earthed at 400V transformer neutral
(g)	Rated frequency	50 Hz
(h)	Rated interrupting current	*
(i)	Rated short- time withstand current	* kA, 1 sec
(j)	Degree of protection	IP4X

Note) *To be determined by the Supplier and subject to the Purchaser's approval

Manual operation of each circuit breaker from the motor control center shall be allowed. The magnetic contactor shall employ a remote operation method by use of AC 220 V. Transient voltage drop due to rush current by a largest capacity motor shall be taken into consideration. Even in case of transient voltage drop, the control system shall be operated continuously. A current limiting reactor or current limiting fuse shall be provided, if necessary.

(4) Existing Electrical Apparatuses to be adapted to the new equipment

(a) Existing 6.3 kV switchgears

As the source for the new metal clad switchgears, the existing feeder unit will be used. The metal clad for each unit shall be fed from two (2) existing feeders. Rating and technical features of these equipments are as follows, further details necessary for the system design shall be investigated at the Site by the Supplier.

(i) Feeders installed in the existing metal clad switchgears

- Type of circuit breaker : oil circuit breaker
- Rated voltage : 10 kV
- Nominal current : 630 A
- Rated interrupting current: ??? kA
- Rated short-time withstand current: 31.5 kA

(b) 6.0kV / 0.4 kV Power Transformer and Feeders to the MCC

As the source for the new motor control center (MCC), the existing transformer and existing feeder unit the power center will be used. The MCC for each unit shall be fed from two (2) existing feeders which shall be mutually interlocked so as not to be switched on simultaneously. Rating and technical features of these equipment are as follows, further details necessary for the system design shall be investigated at the Site by the Supplier:

(i) Existing Transformer

- Voltage ratio : 6.0kV / 0.4 kV
- Rated capacity : 1,000 kVA
- Frequency : 50 Hz
- Rated current (primary/secondary) : 96.2 A / 1,445 A
- No load loss current : 0.588 %
- No load loss : 1,755 W
- Short circuit loss : 12,293 W
- *Short circuit voltage* : 7.21 %
- Liner coil resistance (primary coil at 115 ℃) : 0.426 ohm
- Liner coil resistance (secondary coil at 115 ℃) : 0.00156 ohm
- Zero sequence resistance (at 20 ℃) : 0.0162 ohm

(ii) Feeder circuit breaker installed in the existing power center

- Type : air circuit breaker
- Nominal voltage : 380 V
- Short circuit current: 630 – 6,300 A (0.1, 0.25, 0.4 sec)

11.6 INSTRUMENTATION

11.6.1 Transmitters

Measuring conditions shall be confirmed with the Purchaser prior to the design of the transmitters.

(1) All electronic transmitters shall be of smart type, suitable for peer to peer (4-20mA) connection with portable transmitter calibrator. All transmitters shall have a calibrated accuracy of less than +/-0.1 percent of span or better. The accuracy shall include the effects of linearity, hystersis, repeatability and dead band. All transmitters shall have a temperature coefficient of 1.0 percent or less per 55℃.

(2) Transmitters used for measuring differential pressure, flow and level shall be furnished with a pressembled stainless steel 3-way valve manifold suitable for mounting directly on the transmitter.

(3) Transmitters shall function adequately for at least 150 percent of maximum operating pressure, they shall be capable of withstanding this pressure without damaging the sensing element and without affecting the calibration and performance.

(4) The Supplier shall provide complete set of portable transmitter calibration.

11.6.2 Temperature Elements

(1) All thermocouples shall be dual element and ungrounded type.

(2) Thermocouple assemblies shall be sheathed in a stainless steel tube with ceramic or packed magnesium oxide insulation.

(3) All temperature elements shall be furnished with stainless steel temperature wells.

11.6.3 Level Detector

(1) Level detector for coal bunker shall be ultrasonic type.

(2) Level detector shall have a calibrated accuracy of less than +/-0.25 percent of span or better.

(3) All electrical conduit connections shall be required.

11.6.4 Vibration Monitoring System

(1) Vibrometer for pulverizer and primary gas fan shall be piezo-electric acceleration or electro-dynamic velocity types.

(2) All electrical conduit connections shall be required.

11.6.5 Local Swiches

(1) All switches provided shall be of dry contact snap action type.

(2) All electrical conduit connections shall be required.

(3) Each pressure switch shall be installed complete with isolating valve and test gauge connection with plug.

(4) All pressure switches shall be automatically reset by snap action of the switch. Measuring element shall be of weld sealed metal type. All switches shall have the suitable dead band.

(5) Differential pressure switch shall be furnished with 3-valve manifold.

(6) All level switches shall be direct vessel mounted or external float cage mounted types. Perferred cage connection orientation is upper side and lower bottom.

11.6.6 Local Gauges, Local Meters

(1) The dial cover shall be of heavy-duty glass.

(2) The pressure and differential pressure gauge shall be guaranteed to withstand 1.5 times the full-scale pressure without damage to the gauge, its bourdon tube, movement, or accuracy.

(3) Each pressure gauge shall be installed complete with isolating valve and test gauge connection with plug.

(4) Differential pressure gauge shall be furnished with 3.20 stainless steel 3-way valve manifold.

(5) Level gauge glasses used in conjunction with level instruments shall cover a range in excess of that covered by the associated level instrument, and shall be installed adjacent to the instrument for calibration purposes.

(6) Off set type of gauge cocks shall be supplied as integral parts of the gauge glasses. Body material of gauge cocks shall be constructed of forget carbon steel or 304 stainless steel. Stem and seal material shall be 304 or 3.20 stainless steel. The vessel side connection of gauge cocks shall be spherical union type.

(7) Thermometers shall be bimetallic or liquid filled actuated type.

(8) The accuracy shall be less than ± 1 percent of the temperature reading.

11.7 Power and Control Cables

(1) *Technical Requirement*

(a) All power and control cable shall be complying with ICEA, ASTM and IEC Standards and with the recommendation of the National Electrical Code, ANSI C1.

(b) Conductors in vertical runs shall be supported with non-conducting material.

(c) All terminations shall use 2-hole type lugs for cables larger than #4/0 AWG (or equivalent SI).

(d) All incoming cables for the new switchgears shall be duly sealed and insulated.

(2) Specification for Cables

Insulation shall be suitable for wet and dry locations, and it shall conform to Part 3, Paragraph 3.8, ICEA S.61-402. In general, low voltage cables shall be suitable for a continuous conductor temperature of 75℃. Medium voltage cables shall be suitable for a continuous conductor temperature of 90℃. The table below shows the minimum technical requirements for wire and cable for the power station.

Table TS-1- 03: The Minimum Technical Requirements for Wire and Cable

Voltage Class Rating	Type/No. of Cond./Material	Insulation/Jacket	Application	Minimum Size (or equivalent SI)
300V/105℃	PLTC/Single, Triad, or Multi-Pair/Copper	PVC/PVC	Instrumentation	Minimum Size (or equivalent SI)
300V/105℃	PLTC/Single or Multi-pair/ Copper	PVC/PVC	Thermocouple	#20.w #20 drain wire
300V/105℃	PLTC/Copper	PVC	75 Ohm. Coaxial Cable	#16.w #20 drain wire
300V/200℃	PLTC/Single, Triad, or Multi-pair/Copper	FEP	Instrumentation	#20,RG-59/U
300V/200℃	PLTC/Single or Multi-pair/ Copper	FEP	Thermocouple	#16.w/#18 drain wire
600V/75℃	TC/Single or Multi-conductor/ Copper	XLP/PVC	Power and Control Circuits	#12
5.15kV/90℃ 7.2kV/90℃	Single or Multi-conductor/ Copper	XLPE/PVC or EPR/CPE or CSPE(133% Insulation)	Medium Voltage Power and Distribution Circuit	
Ground Wire	Single/Copper	Bare or Green Insulation	Grounding	
Static and Messenger Wire	High Strength Steel	Bare	Lightning Protection and Cable Messenger	

Note) For the purpose of the isolation from noise and line surge caused by radio noise, thunderbolt, induced voltage and etc, following control cables will be used:

- Compensation cable
- Optical cable
- Coaxial cable
- Sealed or screening cable

12. SCOPE OF THE GOODS

12.1 Principal Goods

The Supplier shall supply the Goods specified hereinafter and the other Goods that are reasonably inferred as necessary to complete the Rehabilitation Work.

The scope of supply of the following Goods shall cover four (4) boilers.

(1) Main equipment included (for each boiler)

(a) Four (4) sets of pulverizer with motor and gear reducer with lubrication system.

(b) Four (4) sets of coal feeder with motor.

(c) Four (4) sets of primary gas fan with motor.

(d) Four (4) sets of seal air fan with motor.

(2) Accessories (for each boiler)

(a) Two (2) sets of Coal bunker modification and gate valves for coal feeders.

(b) Four (4) sets of coal chutes (with raw coal distributors) from existing coal bunker to pulverizer inlets. (refer to Dwg. MON-K-1-08)

(c) Twelve (12) sets of Pulverized coal pipe from above pulverizers to coal burner inlets, including orifices, expansion joints and dampers.
(refer to Dwg. MON-K-1-12,13,14)

(d) Twelve (12) sets of Coal burner (including design). (refer to Dwg. No. MON-K-1-16)

(e) Twenty-four (24) sets of secondary air duct include expansion joints and dampers. (refer to Dwg. MON-K-1-17)

(f) Four (4) sets of hot gas ducts (from FL + 14.0 m to pulverizer inlet), cold gas ducts (from FL + 10.0 m to pulverizer inlet), expansion joints and dampers.
(refer to Dwg. MON-K-1-07)

(g) One (1) lot of cooling water piping with first valve. (Piping after first valve will be provided by the Purchaser.)

(h) Four (4) sets of steam piping with first valve for the pulverizer. (Piping after first valve will be provided by the Purchaser.)

(i) Four (4) sets of base plates, anchor bolts, nuts and templates for pulverizers, primary gas fans, seal air fans, gear reducers and coal feeders.

(j) Four (4) sets of safety cover and galley for inspection

(k) Four (4) sets of inlet valve of spillage hoppers, electric motor driven

(l) Four (4) sets of roller lift detector or other similar devices for pulverizer (if necessary)

(m) Two (2) ultrasonic level defector for coal bunkers.

(n) One (1) lot of vibrometer and its support.

(o) One (1) lot of thermocouple and its support.

(p) One (1) lot of gas pressure gauge and its support.

(q) One (1) lot of instrument and equipment necessary to gear reducer, lubrication system, temperature switches, level switches, limit switches, etc.

(r) Four (4) sets of local instrumentation necessary for operation, including flow orifices.

(s) Four (4) sets of name plate and caution plate.

(t) One (1) lot of Platform, hand-rails and steps for maintenance of the pulverizers, primary gas fans and dampers.

(u) One (1) lot of mono-rail and its support and hoists, each capacity of which enable to lift heavy parts of pulverizer and primary gas fan.

(3) Switchgears and Accessories (for each boiler)

The Supplier shall supply all required switchgears and accessories specified bellow. For details shall be referred to the attached Dwg. MON-K-1-02 and MON-K-1-24.

(a) Two (2) banks of metal clad switchgears for each boiler Unit.

Each bank of switchgear consists of the following units:

- One (1) unit for power receiving that consists of:
  - One (1) set of bus bars with terminals to be connected with incoming cables

- Three (3) molded type current transformers 1.0 class
- One (1) three phase molded type voltage transformers 1.0 class
- One (1) set of over voltage protective relay
- One (1) set of over current protective relay
- One (1) volt meter with a change-over switch
- One (1) ammeter with a change-over switch
- One (1) set of other necessary accessories

• Necessary numbers of motor feeders, each consists of:

- One (1) set of draw-out type vacuum circuit breaker
- One (1) set of molded type current transformers 1.0 class
- One (1) set of protection devices with accessories (microprocessor basis)
- One (1) set of CT test terminal mounted on the front panel
- One (1) set of ammeter with a change-over switch
- One (1) set of grounding wire
- One (1) set of compression type terminals for cable connection
- One (1) set of meggering terminal with a interlock mechanism
- One (1) set of other necessary accessories

(b) One (1) bank of motor control center for each boiler Unit, that consists of following units:

• Two (2) units for power receiving, each consists of:

- One (1) set of bus bars with terminals to be connected with incoming cables
- One (1) set of three pole molded case circuit breaker without automatic trip mechanism
- Three (3) current transformers 1.0 class
- One (1) three phase voltage transformers 1.0 class
- One (1) set of voltage protection relay
- One (1) voltmeter with a change-over switch

- One (1) ammeter with a change-over switch
- One (1) set of other necessary accessories

· Necessary numbers of motor feeders, each consists of:

- One (1) three pole molded case circuit breaker with over current trip mechanism (for short circuit current)
- One (1) three pole magnetic contactor
- One (1) set of thermal over load relay
- One (1) set other necessary accessories

(c) The Supplier shall supply the house for the installation of following new switchgears:

- HV and LV switchgear of bolier 5 and 6
- LV switchgear of bolier 7 and 8

(4) Local control panels (for each boiler)

Local control panels (control panels which enable on-off control and speed control of motor with inverter, and which are fitted with control switches, signal lamps and etc.) for the following equipment shall be supplied by the Supplier of Package-1.

(a) Four (4) sets of local control panel for coal feeder

(5) Emergency stop switches (for each boiler)

The Supplier shall supply the emergency stop switches with accessories for the following equipment:

(a) Four (4) sets of emergency stop switches for pulverizer

(b) Four (4) sets of emergency stop switches for primary gas fan

(6) Cables and Accessories (for each boiler)

The Supplier shall supply all required cables with terminal connections and necessary cable trays specified bellow. For details shall be referred to the attached Dwg. MON-K-1-02 and MON-K-1-24.

(a) All power cables, cable trays and terminals shall be supplied by the Supplier of Package-1.

(b) All control cables, cable trays and terminals shall be supplied by the Supplier of Package-2.

(c) The terminals of electrical equipment supplied by the Supplier shall be fitted with terminal lugs (compression type).

(d) The Supplier shall supply necessary cable trays including cable ladder, racks, junction boxes and their accessories if required.

(7) Instrumentation

The Supplier shall furnish the local control equipment and the local instruments necessary for the direct firing system.
Whereas the modulating control equipment shall be provided by the Supplier of Package-2. The interface points between both Suppliers shall be as follows:

(a) Transmitters

Transmitters for modulating control shall be supplied by the Supplier of Package-2.

The other transmitters, if necessary, for local control and instrumentation shall be supplied by the Supplier.

Primary elements such as a flow orifice or nozzle shall be supplied by the Supplier.

For a transmitter of pressure, one (1) set of impulse pipings, one (1) root valve, one (1) shut-off valve and one (1) drain valve shall be provided by the Supplier.

For a transmitter of differential pressure or flow, one (1) set of impulse pipings, two (2) root valves, two (2) drain valves and one (1) set of equalizing valves shall be provided by the Supplier.

(b) Temperature elements

The Supplier shall supply temperature elements for motor bearing, motor winding, oil lubrication system.

The Supplier of Package-2 shall supply temperature elements for P.C pipes, primary gas.

The Supplier shall provide thermo-wells with bosses or connecting flanges for all the above temperature elements.

(c) Level detector

The Supplier shall supply coal bunker level detector with necessary accessories.

(d) Vibration monitoring system

The Supplier shall supply vibration monitoring system with necessary accessories.

(e) Local switches, local gauges, local meters

The Supplier shall supply all local switches, local gauges, and local meters.

(f) Control drives for dampers

The Supplier shall supply all dampers.

The Supplier of Package-2 shall supply modulating control drives including power supply contactors, connecting linkage with crevice pins, anchor bolts and local switch box.

(g) Motor operated dampers and motor operated valves (on-off control)

The Supplier shall supply all dampers and valves including actuating motor with necessary accessories.

(h) Terminals of equipment

Necessary terminals of equipment shall be provided by the equipment supplier together with cable terminal lugs.

Further details for the supply limits of both suppliers shall be referred to attached drawing MON-K-1-02 and typical instrumentation for the direct firing system shall be referred to attached MON-K-1-03.

12.2 Spare parts and Consumables

(1) The Supplier shall supply spare parts and consumables necessary for three (3) years operation of the Goods. Where as the duration of one (1) year operation should be regarded as six-thousand (6,000) hours.

(2) In addition to the above, the followings shall be included as spare parts :

- For two (2) mills of grinding roll wheel assembly

- For two (2) mills of bowl segments
- For two (2) mills of spring assembly
- For two (2) mills of vane wheel assembly
- For two (2) mills of anti-abrasive internal liner
- two (2) tons of welding rod for overlay
- For eight(8) feeders of conveyor belts
- For four(4) feeders of clean-out conveyor parts
- Two (2) sets of protection devices for metal clad switchgears (microprocessor basis)
- Five (5) % of each kind of transmitters, at least one
- Five (5) % of each kind of temperature elements, at least one

(3) List of spare parts and list of consumables shall be provided in the Technical Schedules of the Bids.

Unit price of each spare part shall be provided in the Price Schedules of the Bids.

(1) Consumables of maintenance tools shall also be provided as a part of consumables.

(2) In addition to the contracted spare parts as above, the Supplier shall supply the spare parts consumed during the warranty Period.

12.3 Special Tools

Special tools for maintenance of the Goods shall be supplied as follows, but not limited to:

The list of special tools shall be provided in Technical Schedules of the Bids.

(1) one (1) set of automatic electric welding machine.

(2) one (1) set of special tools for assembling & disassembling of PGF impeller.

(3) one (1) set of standard tools necessary for assembling and disassembling mechanical equipment.

(4) one (1) cart (2ton tolerable weight) that is trailable by car.

(5) Special Tools for Electrical equipment

(a) one (1) set of VCB vacuum checker with accessories.

(b) one (1) set of relay test tool with accessories.

(c) one (1) set of power insulation tester with 1 kV and 5kV grade.

(d) two (2) sets of DC hand operated megger with 500 V grade.

(e) eight (8) sets of manual operating handles for HV circuit breaker.

(f) four (4) sets of carts for drawing out and transporting HV circuit breaker (if required).

(g) two (2) sets of power cable stripping tool.

(h) two (2) sets of portable transmitter calibrators with all necessary accessories.

(i) one (1) set of oscillograph recorder with all necessary accessories.

(6) one (1) lot of other necessary special tools for maintenance of the Goods.

12.4 Shop Inspection and Test

Test and inspection shall include, at least items specified in code/standard and the following but not limited to.

Items and procedures shall subject to the approval of the Purchaser before the start.

(1) Common

(a) Defective work discovered during inspection shall be remedied free of charge by the Supplier under the terms of the guarantee of the Contract. The costs of inspection of any defective item shall also be borne by the Supplier.

(b) Supplier shall submit the shop test schedules and procedures, at least two (2) months ahead of the test date for Purchaser's approval.

(c) The Supplier shall prepare adequate records of the test and shall supply a minimum of seven (7) copies of such records to the Purchaser.

(2) Mechanical Equipment

(a) Material test in accordance with the material specification at a steel manufacturer to check chemical compositions, mechanical properties, etc.

(b) Verification of Material

Before delivery of raw Material to fabrication, the Supplier shall check the Material with material certificates.

(c) Appearance Check

After completion of fabrication, all temporary fittings welded on shall be removed and finished sufficiently and the surfaces shall be checked before painting to be free from any surface defects, flaw, spatters, burrs, scales, rust and so on.

Painted surfaces shall be free from excessive runs, sags, voids, over spray, blistering, peeling, mud-crack and rust.

(d) Weld Inspection

Shop welds shall be checked visually and by non-destructive test, in accordance with applied standard.

(e) Shop Assembly

Shop assembly of the Pulverizer, Coal feeder, Mill reducer and Primary gas fan shall be performed by the Supplier or Sub-Supplier to assure proper fitting of the various parts and for checking the correctness of clearances and dimensions. Parts thus assembled shall be match-marked for re-assembly at the Site, prior to being dismantled for shipment.

(f) Running test

For the Mill, no load running test shall be carried out at the manufacturer's shop.
For all other rotating equipment shall be also carried out running tests.

(3) Electrical equipment

The Supplier shall be carried out the following tests in accordance with the IEC standard, but not limited to.

- High voltage withstand test for all HV and LV Switchgears, and HV and LV motors
- impulse voltage test for all HV Switchgears and HV motors
- insulation resistance measurement
- sequence test shall for each panel unit of HV and LV Switchgears

(4) Witness tests at the Factory

The Purchaser has the right to witness the tests of materials and element at the manufacturer's factory without additional cost. The Supplier shall provide all necessary assistance for these visits, inspections and checks and give all the information requested.

Expenses needed for these Purchaser's personnel, related the following witness tests shall be included in his Bids:

(a) Pulverizer with gear : two (2) engineers, one time

(If the pulverizing equipment is manufactured separately in some manufacturer and sent directly to the Site, two (2) engineers will witness the test at every manufacturer's shop.)

- dimensional inspection
- material inspection
- no load running test

(b) Coal feeder : two (2) engineers, one time

- dimensional inspection
- material inspection
- no load running test

(c) Primary Gas and Seal air Fans : two (2) engineers, one time

- dimensional inspection
- material inspection
- no load running test

(d) HV Metal Clad Switchgears : one (1) engineers, one time

- dimensional inspection
- high voltage withstand test
- sequence check

(e) HV motors : one (1) engineers, one time

- high voltage withstand test
- no load running test

13. COMMISSIONING

13.1 General

Upon completion of the erection work of the Goods by an erection Contractor the Supplies shall commence Commissioning of the Goods.

Commissioning includes adjustment, test and/or no-load, load test and performance test. The details are specified hereunder, but not limited to.

The Supplier shall cooperate with the Purchaser and the other Suppliers in executing his Works.

- The Supplier shall prepare all necessities for commissioning.

If incorrect erection work is found during the Commissioning period, modification work shall be done by the erection Contractor upon a notice of the Supplier through the Purchaser.

13.2 Commissioning

(1) The Supplier shall submit to the Purchaser the Commissioning procedures including time schedules one (1) month prior to start of the Commissioning.
The procedures shall include adjustment and test procedures, evaluation criteria of adjusted and tested machines, instruments, control apparatus, systems etc. and forms of records.

(2) Detailed contents of Commissioning shall be as follows, but not limited to :

(a) Loop Check and tuning

- Wiring continuity tests
- alignment of equipment
- Calibration of C&I equipment
- Checking and testing electrical relays, pressure switches and instrument transmitters.
- Setting protective devices and electrical protection relays.
- H.V. test for relevant equipment.
- Initial Operation
- Loop Test
- Damper Adjustment
- System Sequential Operation Trial

- Pulverizer (including Pulverized Fuel Pipes) air velocity test
- Control System Adjustment and Setting or Tuning
- Interlock Test
- Operation Test

(b) Operation Test for the Direct firing System

- Continuous operation with rated capacity for each pulverizer.
- Continuous operation with full to minimum load for boiler.
  Performance test for pulverizers is included as follows.
- Capacity
  Coal fineness and moisture will be measured by the Purchaser.
  Mill capacity and power consumption shall be confirmed by the Supplier.
- Turn-down ratio
  Turn-down ratio shall be confirmed by the Supplier.
- Correction curve or factor due to variation of coal property shall be submitted by the Supplier in advance.

(c) Operation test with no load for pulverizer at least during one(1) hour

(d) Vibration and Noise measurement for the pulverizer and its primary gas fans and seal air fans.

(e) Any other items specified in standards and required by the Purchaser. The details shall be discussed and finalized at the time when the procedure is submitted.

13.3 Completion of Commissioning

The Supplier shall give a notice of completion of the Commissioning.
Upon the notice of the completion of the Commissioning if the Purchaser duly judges that the Commissioning is fully completed and the specified performances of the Goods are proved well, the Purchaser shall give a certificate of completion of commissioning.

14. TRIAL RUN

Upon completion the commissioning the Supplier shall start the Trial Run under support of the Purchaser.

The Trial Run is a demonstrative operation of the Goods under the stable operation of the boiler with an output of 420 t/h.

The Trial Run shall be continued for not less than five (5) days.

After satisfactory completion of the Trial Run for each Unit, the Purchaser shall issue a Provisional Acceptance Certificate to the Supplier.

When all the Works completed (it should be the date of Provisional Acceptance for the final unit), the Supplier shall remove from the Site all temporary facilities and the office provided by the Supplier.

15. SUPERVISION SERVICES

15.1 General

(1) The Supplier shall provide qualified and competent supervisors for the erection work of the Goods. The erection work of the Goods will be carried out by an erection Contractor under the control and direction of the Purchaser.

(2) The Supplier shall propose the dispatching schedule of the supervisors, that includes period, man-month and duties of each supervisor and/or skilled worker, in the Technical Schedule.

(3) The Supplier shall supply the instructions for erection work as specified in Claus 5.2.4(6)

(4) The Supplier shall take full responsibility for the safety, protection and security of his supervisors.

15.2 Duties of Supervisor

The supervisor for the erection work shall have the following duties:

- to cooperate with the Purchaser in executing his duties.
- explanation of the erection instruction to the erection Contractor
- to give correct instructions necessary for the erection work to the erection Contractor upon request of the Purchaser or the erection Contractor
- to observe progress of the erection work and to give advice to the Purchaser when he acknowledged any delay in the progress.
- to evaluate the quality of each activities of the erection work and to give advice to the Purchaser when he acknowledged any defect in any activity.
- observation and dimension control of the equipment foundation.
- observation of cable works.
- to measure critical dimensions of essential components.
- to judge whether erection work may proceed to further erection milestone or not.
- to evaluate quality of the whole erection work and to give his comments on the results to the Purchaser upon completion of the erection work.

16. TRAINING OF PURCHASER'S PERSONNEL

16.1 General

The Supplier shall provide training to the Purchaser as the transfer of technology and developing expertise in the area of engineering, operation and maintenance of the Goods.

The number of man-days of training as detailed below shall be included in the Bids.

The Supplier shall be responsible for the development of the training module and program Schedule which shall be submitted to the Purchaser for approval.

The components of the training modules shall include but not be limited to training procedures/ methodology, module content instructional materials such as audio visual materials, tapes and slides, and manuals for each trainee.

During the conduct of the training program the Supplier shall employ qualified English speaking instructors.

16.2 Training at Supplier's Home Country

The Supplier shall train Purchaser's engineers for operation and maintenance. All expenses related to the training shall be borne by the Supplier and shall include but not be limited to travel expenses (international and in-land fares), lodging and per diems, travel and medical insurance, instructors fee, program and miscellaneous cost to be incurred during the training.

The training shall generally be divided on the following basis, subject to the approval of the Purchaser:

- Coal firing system : Three (3) Engineers, two (2) weeks
- Electrical : Two (2) Engineers, two (2) weeks

The cost of such training shall be included in the respective Price Schedules.

16.3 Operation and Maintenance Training at the Site

The Supplier shall provide a comprehensive training program related to design application, operation and maintenance, including trouble shooting of the Goods at the Site during erection work and Commissioning.

The content of the training program shall include but not be limited to:

- Operation and maintenance of coal firing system
- Operation and maintenance covering electrical, mechanical and instrumentation and control

The training programs shall be submitted to the Purchaser for approval.

16.4 On the Job Training

The Purchaser shall provide operation and maintenance personnel to the Supplier for training under the direction of the Supplier for the purpose of on-the-job training.

All instructions shall be in English language.

17. MATERIALS AND SERVICES TO BE PROVIDED BY THE PURCHASER

The Purchaser will provide the followings to the Supplier :

(1) Operational personnel

(2) Coal, electricity, water and land area needed for execution of the Contract

(3) Storage house and outdoor area for the Goods at the Site.

(4) Internal Tele-communication line.

(5) Preparation of heavy oil needed for the boiler operation during the commissioning and trial run periods. The Supplier shall pay the cost of heavy oil consumed to the Purchaser at the rate of ( ) Tg per liter. The average heavy oil consumption of the existing boilers is as follows :

The total consumed of heavy oil shall be shared by the Package-1 and Package-2 Suppliers at the rate of 3:1

When the boiler operation is stopped during the commissioning and trial run by an unexpected cause, the cost of heavy oil consumed during a succeeding boiler operation shall be borne by the responsible Supplier or the purchaser for the cause of interruption.

Whereas average heavy oil consumption for the boiler is as follows:

Attachment –A TECHNICAL SCHEDULES

TABLE OF CONTENTS

Technical schedules

1. Pulverizer

Item	unit	specification
Pulverizer		
Number of Pulverizers per boiler		
type		
Capacity per one mill	kg/h	
Turn down ratio	%	
Working pressure	mmAq.C	
Pulverized coal fineness Retained on 90 micron sieve	%	
Mill rejection rate	%	
Maximum permissible size of raw coal		
Total gas flow upstream of the mill at 27.5t/h coal	Nm^3/h	
Total gas flow downstream of the mill	Nm^3/h	
Gas temperature at mill outlet	℃	
Gas temperature at mill inlet	℃	
Total moisture at mill outlet	%	
Power consumption per mill at Design Coal 27.5t/h	kW	
Total weight of Pulverizer per one mill	kg	
Cooling water requirements per one mill	m^3/h	
Inert steam requirements for each mill (steam at 3 to 5 bar, 280 to 320 ℃)	kg/s for 15 minutes	
Noise level measured at 1m from the mill	dB(A)	
Vibration (max. ,peak to peak)	μ	
Guaranteed life for wearing parts	hr.	
Descriptions for provisions against wear	Document No.	

Technical schedules

1. Pulverizer

Item	unit	specification
Reduction gear		
type		
Speed ratio	r.p.m./r.p.m	
Transfer capasity	kW	
Method of lubrication		
Descriptions for fire protection system		
Driving motor		
Type		
Enclosure		
Insulation class		
Cooling		
Capacity	KW	
Voltage	V	
Rated current	A	
Rush current	A	
Rated speed	r.p.m	
Weight of a motor	kg	

Technical schedules

2. Coal Feeder

Item	unit	specification
Coal feeder		
Type		
Max. capacity (each)	T/h	
Type of Operation		
Design pressure	MmAq.C	
Accuracy of coal flow transmitter at full scale	±%	
Height of material on belt	mm	
Total weight of coal feeder	kg	
Type of belt speed control		
Driving motor		
Type		
Enclosure		
Insulation class		
Cooling		
Capacity	KW	
Voltage	V	
Rated current	A	
Rush current	A	
Rated speed	r.p.m	
Weight of a motor	kg	

Technical schedules

2. Coal Feeder

Item	unit	specification
Clean out conveyer motor		
Type		
Enclosure		
Insulation class		
Cooling		
Capacity	KW	
Voltage	V	
Rated current	A	
Rush current	A	
Rated speed	r.p.m	
Weight of a motor	kg	
Instrumentation on feeder		
Type of Speed sensor		
Type of Material-on-belt switch		
Type of Discharge pluggage switch		
Type of Load cells		

Technical schedules

3. Primary Gas Fan

Item	unit	specification
Primary gas fan		
Number per boiler		
Type		
Rated gas flow (at ℃)	kg/s	
Gas temperature (max.)	℃	
Rated Total pressure	mmAq.C	
Rated Speed	r.p.m.	
Weight of a fan	kg	
Efficiency of fan	%	
Power consumption at rated state	kW	
Ash concentration	g/kg gas	
Noise level	dB(A)	
Vibration (max. ,peak to peak)	μ	
Description for countermeasures against corrosion	Document No.	
Driving motor		
Type		
Enclosure		
Insulation class		
Cooling		
Capacity	kW	
Voltage	V	
Rated current	A	
Rush current	A	
Rated speed	r.p.m	
Weight of a motor	kg	

Technical schedules

4. Seal air Fan

Item	unit	specification
Seal Air Fan		
Number per boiler	Quantity	
Type		
Rated air flow (at ℃)	kg/s	
Rated Total pressure	mmAq.C	
Rated Speed	r.p.m.	
Power consumption at rated state	kW	
Weight of a fan	kg	
Driving motor		
Type		
Enclosure		
Insulation class		
Cooling		
Capacity	KW	
Voltage	V	
Rated current	A	
Rush current	A	
Rated speed	r.p.m	
Weight of a motor	kg	

Technical schedules

5. Accessories

Item	unit	specification
Coal bunker modification		
Bunker outlet size	mm x mm	
Total weight of new bunker parts per boiler	kg	
Outline of gate valve	Document No.	
Outline of coal exhaust provisions	Document No.	
Coal Chute		
Chute size(I.D. x thickness)	mm ϕ / mm	
Total weight of Coal Chute per boiler	kg	
Outline of raw coal distributor	Document No.	
Hot Gas Duct		
Duct size	mm x mm	
Total weight of Hot Gas Duct per boiler	kg	
Outline of Insulation and Lagging	Document No.	
Total weight of Hot Gas Duct for Option	kg	
Ash collection facilities (Option)		
Cyclone size	ϕ mm x mm	
Efficiency	%	
Total weight of Cyclone per boiler	kg	
Outline of the facility	Document No.	

Technical schedules

5. Accessories

Item	unit	specification
Cold Gas Duct		
Duct size	*mm x mm*	
Total weight of Hot Cold Duct per boiler	kg	
Outline of Insulation and Lagging	Document No.	
Total weight of Cold Gas Duct for Option	kg	
Outline of erection work	Document No.	
Pulverized coal piping		
Pipe size (I.D.x thickness)	mm ϕ x mm	
Total weight of Pulverized coal piping per boiler	kg	
Description for countermeasures against corrosion	Document No.	
Coal Burners		
Raw coal throughput for each burner	t/h	
Pulverized coal exit velocity	m/s	
Secondary air exit velocity	m/s	
Weight of a Burner unit	kg	
Outline of burner design	Document No.	

Technical schedules

5. Accessories(Other necessary Accessories than described ones shall be added.)

Item	Quantity	specification
Damper		
Coal gate		
Pulverizer outlet damper		
Hot gas damper		
Cold gas damper		
Secondary air damper		
Burner cut-of damper		

Technical schedules

6. HV Switchgear

Item	unit	specification
Power receiving unit		
Number of cubicles per boiler		
Type of VT		
Voltage ratio,	V/V	
Rated burden	VA	
Feeder unit		
Number of cubicles per boiler		
Rated current of main busbar	A	
Rated short-time withstand current	kA/sec	
Rated interrupting current	KA	
Dimensions of each bank (WxDxH)	mxmxm	
7.2kV circuit breaker		
Type		
Rated voltage	kV	
Rated short-time withstand current	kA/sec	
Rated interrupting current	kA	
Rated closing time	sec	
Rated interrupting time	cycle	
Life time for on-off of rated interrupting current	times	
Life time for on-off of rated current	times	

Technical schedules

7. LV Motor Control center

Item	unit	specification
Power receiving unit		
Number of units per boiler		
Rated current of main bus bar	A	
Rated short-time withstand current	kA/sec	
Rated interrupting current	kA	
Type of circuit breaker		
Feeder Unit		
Number of units per boiler		
Rated current of main bus bar	A	
Rated short-time withstand current	kA/sec	
Rated interrupting current	kA	
Type of circuit breaker		
Dimensions of cubicle per boiler (WxDxH)	mxmxm	
Switchgears house (WxDxH)		
HV and LV switchgear of boiler 5 and 6	mxmxm	
LV switchgear of boiler 7 and 8	mxmxm	

Technical schedules

8. Instrumentation

Item	unit	specification
Transmitters		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Temperature elements	Quantity	
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Level detector		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Vibration monitoring system		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Local swiches		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Local gauges		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Local meters		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	

Technical schedules

9. Special Tools (Other necessary special tools than described ones shall be added.)

Item	Quantity	Specifications
Automatic electric welding nachine		
Special tools for assembling & disassembling of PGF impeller		
VCB vacuum checker with accessories		
Relay test tool with accessories		
oscillograph recorder with all necessary accessories		
Power Insulation tester with 1kV and grade		
Hand operated megger with 500V grade		
Manual breaker handles for each unit		
Power cable stripping tool		
Portable transmitter calibrators with all necessary accessories		

Technical schedules

10. Spare Parts(Other necessary spare parts than described ones shall be added.)

Item	Quantity	Specifications
Grinding roll sets		
Bowl segment		
Spring assembly		
Vane wheel assembly		
Anti-abrasive internal liner		
Welding rod for overlay		
Conveyor belts		
Clean-out conveyor parts		
Grounding relay (67) for metal clad switchgears		
Over-current relays (49, 50 and 51) for metal clad switchgears		

Technical schedules

11. Supervisors for erection work

	Occupation	months
1st unit		
2nd unit		
3rd unit		
4th unit		

Technical schedules

12. Nominated Manufacturer List

Name of Goods	Manufacturer	Country
1. Pulverizer		
2. Reduction gear		
3. Fire Protection		
4. Coal feeder		
5. Primary Gas Fan		
6. Seal Air Fan		
7. motors		
8. HV Switchgear		
9. HV Circuit breaker		
10. LV Motor Control Center		

Technical schedules

13. Delivery Schedule

Delivery No.	Delivery Date after Effective Date of Contract In Months
Delivery 1 (1st Unit)	
Delivery 2 (2nd Unit)	
Delivery 3 (3rd Unit)	
Delivery 4 (4th Unit)	

Technical schedules

14. Commissioning Period

Unit	Commissioning Period In Months
Commissioning for the 1st Unit	
Commissioning for the 2nd Unit	
Commissioning for the 3rd Unit	
Commissioning for the 4th Unit	

Technical schedules

15. Pulverizer (Alternative)

Item	unit	specification
Pulverizer		
Number of Pulverizers per boiler		
type		
Capacity per one mill	kg/h	
Turn down ratio	%	
Working pressure	mmAq.C	
Pulverized coal fineness Retained on 90 micron sieve	%	
Mill rejection rate	%	
Maximum permissible size of raw coal		
Total gas flow upstream of the mill at 27.5t/h coal	Nm^3/h	
Total gas flow downstream of the mill	Nm^3/h	
Gas temperature at mill outlet	℃	
Gas temperature at mill inlet	℃	
Total moisture at mill outlet	%	
Power consumption per mill at Design Coal 27.5t/h	kW	
Total weight of Pulverizer per one mill	kg	
Cooling water requirements per one mill	m^3/h	
Inert steam requirements for each mill (steam at 3 to 5 bar, 280 to 320 ℃)	kg/s for 15 minutes	
Noise level measured at 1m from the mill	dB(A)	
Vibration (max. ,peak to peak)	μ	
Guaranteed life for wearing parts	hr.	
Descriptions for provisions against wear	Document No.	

Technical schedules

15. Pulverizer (Alternative)

Item	unit	specification
Reduction gear		
type		
Speed ratio	r.p.m./r.p.m	
Transfer capasity	kW	
Method of lubrication		
Descriptions for fire protection system		
Driving motor		
Type		
Enclosure		
Insulation class		
Cooling		
Capacity	KW	
Voltage	V	
Rated current	A	
Rush current	A	
Rated speed	r.p.m	
Weight of a motor	kg	

Technical schedules

16. Exhauster (Alternative)

Item	unit	specification
Exhauster		
Number per boiler		
Type		
Rated gas flow (at ℃)	kg/s	
Gas temperature (max.)	℃	
Rated Total pressure	mmAq.C	
Rated Speed	r.p.m.	
Weight of a fan	kg	
Efficiency of fan	%	
Power consumption at rated state	kW	
Ash concentration	g/kg gas	
Noise level	dB(A)	
Vibration (max. ,peak to peak)	μ	
Description for countermeasures against corrosion	Document No.	
Driving motor		
Type		
Enclosure		
Insulation class		
Cooling		
Capacity	KW	
Voltage	V	
Rated current	A	
Rush current	A	
Rated speed	r.p.m	
Weight of a motor	kg	

Technical schedules

17. HV Switchgear (Alternative)

Item	unit	specification
Power receiving unit		
Number of cubicles per boiler		
Type of VT		
Voltage ratio,	V/V	
Rated burden	VA	
Feeder unit		
Number of cubicles per boiler		
Rated current of main busbar	A	
Rated short-time withstand current	kA/sec	
Rated interrupting current	KA	
Dimensions of each bank (WxDxH)	mxmxm	
7.2kV circuit breaker		
Type		
Rated voltage	kV	
Rated short-time withstand current	kA/sec	
Rated interrupting current	kA	
Rated closing time	sec	
Rated interrupting time	cycle	
Life time for on-off of rated interrupting current	times	
Life time for on-off of rated current	times	

Technical schedules

18. LV Motor Control center (Alternative)

Item	unit	specification
Power receiving unit		
Number of units per boiler		
Rated current of main bus bar	A	
Rated short-time withstand current	kA/sec	
Rated interrupting current	kA	
Type of circuit breaker		
Feeder Unit		
Number of units per boiler		
Rated current of main bus bar	A	
Rated short-time withstand current	kA/sec	
Rated interrupting current	kA	
Type of circuit breaker		
Dimensions of cubicle per boiler (WxDxH)	mxmxm	
Switchgears house (WxDxH)		
HV and LV switchgear of boiler 5 and 6	mxmxm	
LV switchgear of boiler 7 and 8	mxmxm	

Technical schedules

19. Instrumentation (Alternative)

Item	unit	specification
Transmitters		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Temperature elements	Quantity	
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Level detector		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Vibration monitoring system		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Local swiches		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Local gauges		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	
Local meters		
Original Supplier and Type		
Quantity	Quantity	
Condition for use(temperature,humidity)	℃,%	

Technical schedules

20. Special Tools (Alternative) (Other necessary special tools than described ones shall be added.)

Item	Quantity	Specifications
Automatic electric welding nachine		
Special tools for assembling & disassembling of PGF impeller		
VCB vacuum checker with accessories		
Relay test tool with accessories		
oscillograph recorder with all necessary accessories		
Power insulation tester with 1kV and grade		
Hand operated megger with 500V grade		
Manual breaker handles for each unit		
Power cable stripping tool		
Portable transmitter calibrators with all necessary accessories		

Technical schedules

21. Spare Parts (Alternative)

Item	Quantity	Specifications
Grinding roll sets		
Bowl segment		
Spring assembly		
Vane wheel assembly		
Anti-abrasive internal liner		
Welding rod for overlay		
Conveyor belts		
Clean-out conveyor parts		
Grounding relay (67) for metal clad switchgears		
Over-current relays (49, 50 and 51) for metal clad switchgears		

Technical schedules

22. Supervisors for erection work (Alternative)

	Occupation	months
1st unit		
2nd unit		
3rd unit		
4th unit		

Technical schedules

23. Nominated Manufacturer List (Alternative)

Name of Goods	Manufacturer	Country
1.Pulverizer		
2.Reduction gear		
3.Fire Protection		
4.Coal feeder		
5.Exhauster		
6. motors		
7.HV Switchgear		
8.HV Circuit breaker		
9.LV Motor Control Center		