
 PMC	PROJECT MANAGEMENT CELL UNDP/GEF PROJECT (STEEL)	TIRFAC HARDWARE CENTRE NISST – MANDI GOBINDGARH	 PMC
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ANNEX - I

INSTRUCTION TO TENDERERS

1. The Project Management Cell (PMC) invites Sealed Bids for the supply of goods to the UNDP/GEF Project of Ministry of Steel, Government of India.
2. The Bidder is expected to examine all corresponding instructions, forms, terms and specifications contained in the Tender Documents. Failure to comply with these documents will be at the Bidder's risk and may affect the evaluation of the Bid.
3. **How to Submit the offer:** The Bid must comprise of two parts i.e Techno-commercial Bid and Financial Bid. These two bids will be sealed separately. The first envelop will bear the name of tenderer and the specification "Techno-commercial Offer". The second envelop will contain the Financial Bid. This envelop will bear the name of the Tenderer and the specification "Financial Offer". Both envelop will be introduced into a third envelop bearing the name of the tenderer and the title of Tender.
 - (a) **Techno-commercial Bid** including documentary evidence that the goods to be supplied conform to the technical specifications with necessary literature, drawings, and data, customers reference list in India for similar job, a letter from the principal in support of appointing the Bidder as their Sole Selling Agent / Associates in India, after sales & service network etc.

Item wise confirmation on commercial terms and conditions should be furnished, as detailed below: -

- **Bid Security / EMD:** Submission of EMD of Rs 1,50,000/- (Rs One lakh fifty thousand only) by Demand Draft in favor of "UNDP/GEF Project" payable at New Delhi is mandatory. The EMD Demand Draft should be enclosed with the **Techno-Commercial Bid** (not with Price Bid). In absence of which the bid will be summarily rejected.
 - Bid Security / EMD of unsuccessful bidder will be discharged or returned as promptly as possible but not later than ten (10) days after the placement of order.
 - The successful Bidder's Bid Security / EMD will be discharged or returned upon the Bidder signing the Purchase Order, and furnishing the performance Security,
 - The Bid Security / EMD may be forfeited, if the successful Bidder fails to sign the Purchase Order in accordance or does not furnish Performance Security
- **Validity of Bid:** The tender shall be submitted within 4 (four) weeks from the date of Global Tender Notice and shall be valid for a period of 3 months from the date of submission. Any bid received after the deadline of submission of bid will be rejected and will be returned unopened to the bidder.

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- The tenderers must read carefully each and every item of conditions of contract as given in *Annex – III* and should submit in writing the confirmation / observation itemwise. Wherever they are in agreement it should be simply written as agreed.
- **Performance Guarantee:** The tenderer shall stand guarantee of the performance guarantee parameters of their equipment / system and the time period over which the performance will be shown to the buyer.

(b) **Financial Bid:**

- Bid prices shall be fixed till validity period of the tender and shall be quoted either in Indian Rupees or US Dollar depending upon Indigenous / imported items. The prices quoted shall be CIF / FOR and shall indicate separately taxes, duties, freight, insurance, handling charges etc. If taxes and duties are not indicated the price will be taken as inclusive of same.
 - Prices of spares for 2 years of operation.
 - Price of consumables for 3 months, if any.
 - Commissioning consumables will be treated as part of supply of equipment, the tenderers should indicate the number / quantity of each items.
 - **Terms of Payment:** The tenderer should confirm the terms of payment indicated in *Annexure – III*.
4. **Procedure for Tender Evaluation:** The offers will be evaluated by a Tender Committee duly constituted for the present tender.

The technically acceptable offer means the offer that is in full accordance with the requirements stipulated in tender specification (*Annex – II*) and which score atleast 80% marks in the Technical Evaluation. A complete proposal with the project timeline, identified milestones, etc. will carry special weightage in the evaluation of the technical bid.



The evaluation criterion will be the UNDP evaluation system which is based on quality as well as cost, with 60% weightage for the technical bid and 40% for the financial bid.

5. **Special Notes:** UNDP/GEF Project (Steel) reserves the right not to place purchase order based on the results of this Call for Offers, in the case that circumstances change.

Expenditures for elaboration and presentation of the Offer will be covered by the applicant and will not be reimbursed by UNDP/GEF Project.

Requests regarding the selection results may be sent by fax to the fax number +91-11-26517568, if required.

Offers received after the deadline will be returned to the applicants, without being opened. The other offers will be retained in UNDP/GEF Project archives.



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Annex - II

SPECIFICATION FOR HIGH-TECH COAL PRODUCER GASIFIER

1.0 GENERAL

- 1.1 This specification covers the Design, Fabrication, Manufacture, Procurement, Inspection & Testing, Supply, Delivery at site, Unloading and storage, Erection, Painting, Testing and Commissioning of a High-Tech Coal Producer Gasifier of capacity 1600 – 1800 Nm³/h, GCV 1400 – 1600 Kcal/nm³. The gasifier is proposed to be installed in the ‘TIRFAC Hardware Centre’ at the NISST, Mandi Gobindgarh (Punjab). The area layout of proposed centre is shown in Drg. No. PMC/TIRFAC/01/Rev0 enclosed herewith for the information of the tenderer.
- 1.2 The gas produced shall be used as a fuel for the Reheating Furnace, Walking Hearth type (5 tph), with provision for dual-fuel firing i.e; oil and gas as well as with Regenerative Burners / High Temperature Air Combustion (HTAC) systems. The minimum furnace temperature is desired to be maintained around 1300⁰C.
- 1.3 The objective of the new technology is to produce a clean and consistent quality producer gas of higher calorific value from any grade of Indian Coal of A to E grade.
- 1.4 The work shall be carried out by the successful tenderer on a completely turnkey basis including civil foundation work with suppliers own supervisors, masons, technicians, tools and tackles, erection material and equipment.
- 1.5 The scope of supply should be inclusive of coal charging system, dedusting system, hydraulic, water circulation system, air blowers, feed water pump, lubrication system, instrumentation & control, chimney, any other items which are not specifically mentioned but required for complete plant & equipment.
- 1.6 The gasifier must provide higher thermal efficiency around 90%, and high calorific value of gases as mentioned at Item No. 1.1 above with advanced design such as two-stage gasification process. It should also take care for environmental aspects as well as gas cleaning system according to

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application of the gas. These aspects may be taken care by using following changes:

1. Increase in oxygen in the feed air to the extent of 27 – 30% or at the point of exit so that volatiles poly -nuclear hydrocarbon break within the reactor by dividing reactor into zones.
2. Addition of biomass with coal and making the feeder acceptable for co-firing system.

Tenderer should adopt any of the methodology either by one or taking multiple mode of the mentioned points given above.

- 1.7 The tenderer may also submit an alternative offer if so desired with sufficient justification.



2.0 TECHNICAL SPECIFICATION

- 2.1 In order to have the best performance of a Producer Gas Plant, the quality of coal plays a major role. While conventional Producers can somehow perform (with interruptions) with higher grades of coals like “A” or “B”, New Generation gasifiers, on the other hand, should perform smoothly with appreciable thermal efficiency with ‘A’ to ‘E’ grades of hard bituminous non caking coal. Tenderer should specify the desired physical Properties of Coal.

The typical Indian coal characteristics are given below: -

- | | | | |
|------|---------------------------------------|---|------------------------------------|
| i) | BS Swelling Index | - | Less than 1.00 |
| ii) | Ash fusion temperature under reducing | - | Around 1100 ⁰ C or more |
| iii) | Sulphur | - | Less than 0.3% |
| iv) | Moisture | - | 5% to 9% |
| v) | Volatile Matters ((% wt/wt) | - | 25 – 32 |
| vi) | Ash (within) | - | 45% |



- 2.2 The extended portion of gasifier should be in such a position so that volatiles produced in the reactor by feed i.e coal/biomass or its mixture while moving downwards gets stripped off its volatile matter to a great extent and it should be transformed to ‘Near coke ’ state for a higher reactivity, the product gas on the other hand, while moving upward should make counter current to the incoming coal stream and gets auto carburated with the stripped and distilled volatile matters of coal to higher

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calorific value. Vendor must provide complete description / design at the time of submission of tender document.

- 2.3 Design of the Ash-Bowl should facilitate smoother out-flow of Ash.
- 2.4 Coal charging system should provide better distribution of coal in a leak-proof manner to avoid emission of gas and particulate matters to the surroundings.
- 2.5 Provision of Double off-takes for producer gas from the top of the Shaft for smooth gas off-take and better distribution and coverage of gas through coal-bed void spaces.
- 2.6 The two gas streams with full quality of Producer gas coming out from the two off-takes shall run parallel to the mixing cum washing chamber and shall be mixed together at the washing chamber where this should be washed with hot (60⁰ C to 70⁰C) collected at the bottom of the washing chamber, after dewatering.
- 2.7 The system should be completely free from liquid as well as gaseous effluents.
- 2.8 The process should be Eco-friendly, equipment operational-friendly and should conform to Pollution Control Board norms for environment protection and the work force.
- 2.9 The generated gas should be fairly pure and consistent in quality. After the mixing-cum-washing chamber and separator, the dust and tar particles of more than 40 microns should be mostly removed to less than 150 ppm in the final gas. The minimal tar vapor either it should be completely burnt out in the furnace or near to complete burning so that the flue gas will be tar free. So far as Sulphur is concerned, most Indian coal contains less than 0.3% Sulphur by weight. The producer gas should pick up less than 50% of sulphur of coal. On this basis, the SO₂ contents in the flue gas with about 2% O₂ will hardly be 30 ppm.
- 2.10 An on-line gas analyzer system should be included in the package of the gasifier. This instrument would be capable of analysing coal gases coming from gasifier, monitor atmosphere, forecast fires and explosions, providing a safer working environment.



The analyzer would have two column ovens with independently controlled temperature and comes with six columns, three preparation separation columns used to assist the three main columns. The instrument should be

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capable of finishing entire hazardous compounds analysis in 5-10 minutes. These compounds are non-condensed, condensed, organic, inorganic and fire hazard gases (CO, C₂H₄, C₂H₂).

- ❑ Fitted with one TCD, two FIDs, and a methane conversion oven. The instrument may be capable of analyzing O₂, N₂, CH₂, CO, CO₂, C₂H₆, C₃H₈, C₄H₁₀, C₂H₄, C₂H₂, etc.
- ❑ The minimum detection level for fire hazard gases: CO, C₂H₂ <=0.5ppm, C₂H₄<=0.1ppm.
- ❑ Real time monitoring, oxidization rate in coal to improve the accuracy of hazard forecast.
- ❑ Monitoring the fire hazard zone to scientifically decide if the fire has been distinguished.
- ❑ Sampling, analysis, and storage are all automatic and computer-controlled.
- ❑ The data workstation can simultaneously process up to four data channels. Based on a sophisticated algorithm to graphically interact with the user about the activities within the combustion triangle.
- ❑ Special suspension system to absorb shaking of equipment and reduce damage to instruments on rough terrain.
- ❑ Chromatographs would have excellent stability, quick analyzing, and reliable results.



- 2.11 The tenderer shall clearly stipulate the various physical characteristics of the producer gas including: -
- ❑ Pressure of gas at the battery limit (Minimum desirable pressure: 1000 mmWC)
 - ❑ Temperature of gas at the battery limit.
 - ❑ SP gravity of gas
 - ❑ Viscosity of gas
- 2.12 The tenderer should also submit the detailed heat and mass balance as well as the economics, as compared to use of other fuels such as furnace oil, natural gas, lump / pulverized coal.
- 2.13 The tenderer should submit in the tabular form the generation of GHG emissions with regard to use of different fuels, as mentioned above.

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- 2.14 The gasifier shell should be fabricated from boiler quality plates of appropriate thickness and suitably lined with refractory in the desired zone. The bottom portion i.e grate area should be designed to avoid formation of lumpy clinker even with high ash which fuses at a relatively low temperature. In case of lump clinker, the same may be broken up.
- 2.15 A sectional sketch of an Extended Shaft Top off-take Gasifier has to be shown along with various reaction zones and the prime parts from top to bottom should be clearly specified by the vendor in following aspects:
- i) Overhead coal Bunker and feeding system should be pneumatic control through air.
 - ii) Electrical Hoist / Belt Conveyor for lifting Coal.
 - iii) Refractory lined Shaft so as to sustain temperature up to 1000 deg C.
 - iv) Water jacketed Bottom Shell or Generator Proper.
 - v) Ash-Bowl with bottom seal and skirt should be designed so that it should not chock.
 - vi) Double Gas off-takes at the top of extended shaft.
 - vii) Washing cum Mixing chamber with phenol water circulation and tar-collector at the bottom of washing chamber.
 - viii) Steam drum with soft-water and proper piping.
 - ix) Air-Blowers with associated steam – air mixer, BST controller and air piping to the bottom of Ash bowl.
 - x) Phenol water settling tank with circulation pumps.
 - xi) All Battery limit piping and fittings for Gas, Water, steam and air.
 - xii) Gas vents from outlet off-takes.
 - xiii) Instrumentation with central panel.
 - xiv) Electricals including M.C.C. L.C.S.S., Cabling, earthing should be as per specified ISO manual etc.
 - xv) All civil works, Foundation, building and Structural including insulation and paintings as per specification needed by the vendor.
 - xvi) Various reaction zonesto be shown in the sketch.
 - xvii) Gas cleaning system including Electro Static Precipitator (ESP).

3.0 CONTROL & INSTRUMENTATION

- 3.1 The operation of Producer Gas Plant should be semi automatic control right from Coal feeding, introduction of air and steam for best benefit of

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Calorific value down to final output of Producer Gas Controlled as per heat demand. With change in the heat demand, the production of gas should be easily changed with change of air-blast / any other method. The co-related charts of heat demand vs air-blast and coal feed vs air blast should be available for ease of operation. The operation of the plant should have sufficient flexibility to take control of operation schedule. The control & instrumentation must consist of at least following control loops with appropriate Display & MMI (Man Machine Interface) and appropriate data storage (Recording) devices: -

- i) Control of Coal feed as per demand.
- ii) Control of B.S.T. (Blast Saturation Temperature)
- iii) Control of air introduction as per heat demand in down-seam section.
- iv) Temperature and Pressure Control of gas
- v) Control of ash discharge.



3.2 **Recording & Documentation**

All the Instrumentation is to be supplied along-with:

- 3.2.1 Operation & Maintenance manuals
- 3.2.2 Calibration Certificates
- 3.2.3 Necessary Accessories & Protection for Installation

4.0 **DESIGN STANDARDS**



- 4.1 The equipment and materials shall be in accordance with the relevant standards of the Bureau of Indian Standards. Wherever Indian Standards do not exist, components shall be designed, assembled and tested in accordance with the modern practice prevailing in the field taking into consideration International standards such as BS/ASA.
- 4.2 The equipment and materials shall also be designed in accordance with the latest Indian Electricity Rules and Electricity Rules Prevailing in the state as regards the safety, Earthing and other associated provisions specified therein for installation and operation of electrical equipment.
- 4.3 The requirements of ‘Central Board for the Prevention & Control of Pollution’ shall be considered in the design of the chimney. The chimney shall be generally designed inline with the requirement indicated in IS-6533. The chimney shall be lined upto one third of it’s height with suitable refractory and insulation lining to withstand the desired temperature condition.
- 4.4 All drawings and documents shall be in English language.

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5.0 SCOPE OF WORK OF THE SUPPLIER

5.1 The scope of work shall include: -



- Design & Engineering
- Supply of all materials required for the satisfactory and efficient operation of the complete gasifier, as broadly specified at para 2.0 above, viz:
 - ❑ Fabricated Structural for complete furnace, flue duct and chimney
 - ❑ Castings (C.I , HRCI and HRS castings)
 - ❑ Mechanical Equipment
 - ❑ Refractories & Insulating Materials
 - ❑ Instrumentation & Controls
 - ❑ Electrical including drive motors, MCC, local control desk, PushButton Stations, etc (Refer *Annex – IIb*).
 - ❑ Pneumatic Equipment including cylinder, if any.
 - ❑ Piping, valves & fittings for hydraulics, water, Pneumatic system etc.
 - ❑ Any other equipment not mentioned above but required for the completeness and efficient operation of the furnace.
 - ❑ Supply of commissioning spares.
 - ❑ Supply of first fill of oils & greases
 - ❑ Supply of spares for 2 years of normal operation of the gasifier
 - ❑ Supply of Three (3) sets of GA drawings showing plan, elevation and sections, P&I diagram, Electrical Control Schemes/single line diagram etc. for approval of purchaser/consultants within 2 weeks of the placement of order.
 - ❑ Supply of three (3) sets of foundation plans showing outline with load data, Bolt dimensions, pocket size and depth, grouting etc. to the purchaser within 2 weeks of approval of GA and other drawings by the purchaser or their authorized representative.

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- Supply of four (4) sets of manuals for the installation, commissioning, operation and maintenance of the gasifier at-least two (2) months before the commissioning.
- Supply of Bar Chart showing the schedule of various activities such as fabrication, manufacture, procurement, delivery after inspection, erection testing and commissioning including trial run and final acceptance test / performance guarantee test.
- Fortnightly progress report during the period of execution
- Supply of Inspection report with manufacturer's test certificates of structural, castings, pipes, valves and fittings, mechanical equipment, refractories, electric motors etc. prior to inspection.
- Final painting with one coat of primer and two coats of finished paints to all fabricated structures as per purchaser's approved quality and colour code.
- Erection and commissioning of the complete equipment with contractor's own manpower, tools & tackles.
- Handing over the gasifier to the purchaser for trial production after Preliminary Acceptance Test (PAT).
- Performance Guarantee Test (P.G.Test) / Final Acceptance Test (FAT) for acceptance of gasifier and auxiliaries by the purchaser after successful P.G. Test.

6.0 INFORMATION TO BE FURNISHED WITH THE OFFER



- 6.1 The following information shall be supplied in detail for the technical and commercial evaluation of the bid: -
- General arrangement drawing for the gasifier, highlighting key dimensions, length of each zone etc both in plan and elevation. Typical design details of different areas shall be submitted.
 - General description of gasifier design, P&I diagram, heat mass & energy balance.
 - Performance guarantee for gasifier capacity, specific fuel consumption. Calorific value (Gross & Net), CO₂ emissions etc.
 - Complete detailed specifications of the various items offered, including makes, along with catalogues, literature etc. (Preferred makes for major items of equipment are given in **Annexure – IIa**).

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- Requirement of various utilities such as water & power including emergency requirement in case of power failure.
- Items-wise weight of: -
 - Structural Steel
 - Castings
 - Mechanicals
 - Refractories & Insulation materials; and
 - Piping & supports
 - Chimney
- List of imported items, if any,
- Delivery period and time schedule of completion of work.
- List of references of similar work executed by the supplier elsewhere during the last 5 years including details thereof.

6.2 Price: -

- For design & engineering
- FOR destination price for supply of equipment (item-wise) in the following break-up inclusive of packing and forwarding charges.
 - Structural Steel parts for gasifier proper
 - Castings
 - Mechanical Equipment
 - Combustion Equipment
 - Refractories & insulation materials for gasifier, duct & chimney
 - Piping, piping insulation & supports
 - Flue duct structurals
 - Chimney
 - Instrumentation & controls
 - Electrical Equipment
 - Pneumatic Equipment
 - Hydraulic Equipment such as power pack unit and cylinders.
 - Air drier system for instrumentation if any.

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- FOR price for supply of spare parts for 2 years normal operation basis including list of the items and quantity offered.
- Duties, taxes, freight and insurance charges shall be shown separately.
- Charges for erection & commissioning including supervision.
- Other terms & conditions, if any

7.0 TRAINING



The supplier will provide training to operating personnel of purchaser for 4 weeks at site in operation & maintenance of the complete plant, free of cost. In case, the training is desired in a running plant of similar type prior to commissioning of this unit, the terms & conditions of the same should be clearly illustrated in the offer.

8.0 DELIVERY

The gasifier with all its auxiliary equipment and facilities as per scope of this specification shall be delivered, Erected, Commissioned and Handed over to purchaser within a period of 6 (six) months from the date of issue of letter of intent (LOI). Tenderer shall note that the delivery period is the essence of the contract. Liquidated Damages (L.D) will be applicable towards delayed delivery and deficiency in performance guarantee parameters. Necessary bar chart showing the schedule of activities shall be furnished in the offer.

9.0 PERFORMANCE GUARANTEE

- 9.1 Preliminary Acceptance Test (PAT) will be done after completion of the complete erection and testing of the gasifier.
- 9.2 Final Acceptance Test (FAT) will be done after running of the gasifier for one month.
- 9.3 In both PAT and FAT, performance of the gasifier will be assessed by measuring the following parameters: -
 - (i) Gas output, Nm³/h.
 - (ii) Gross calorific value, Kcal/nm³
 - (iii) Emission as per Central Pollution Control Board norms.
 - (iv) Safety aspects
 - (v) Leak proof both for gas and particulate matter.
 - (vi) Content of dust and Tar & SO₂ in the gas.
 - (vii) Pressure and temperature of the gas at the battery limit.

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10.0 GENERAL CONDITIONS OF SUPPLY WILL BE AS PER ANNEX – III

11.0 TENDER SUBMISSION



The offer shall be sent at the address given below:

PROJECT MANAGEMENT CELL
UNDP/GEF Project (Steel)
Ministry of Steel, Government of India,
301-306, Aurobindo Place, Hauz Khas, (3rd floor)
New Delhi – 110016, India.
Tel : +91-11-26534397, 26862478
Fax : +91-11-26517568
E-Mail : srrm_india@undpgefsteel.org

Kind Attn:

Shri S Dewan, National Project Coordinator.



Shri G Mishra, Manager (Projects & Contracts)

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Annexure – IIa

**PREFERRED MAKES
OF
MAJOR ITEMS OF EQUIPMENT
FOR
HIGH-TECH COAL GASIFIER**

S.No	Material	Make
1.0	Refractories	
1.1	Fire Bricks & high Alumina Bricks	Maithan Ceramics / Valley Refractories / ACC / TRL / BMA / Dalmia Refractories
	Light Fire Bricks	Maithan Ceramics / Valley Refractories / BMA / Dalmia Refractories
	Cold Face Bricks	Maithan Ceramics / Valley Refractories / BMA / Dalmia Refractories
	Calcium Silicate Boards	Hyderabad Asbestos
	Suspended Roof Refractories	Detrick / Valley / BMA / Dalmia Refractories
	Castables	ACC/ Valley / BMA / Dalmia Refractories
	High Alumina Refractory in Ejector Zone	TRL 88
	Ceramic Fiber	Orient Ceramics / Murgappa Morganite
	Mineral Wool	Lloyd Insulation / Indobell Insulation
2.0	Blowers	Flakt (ABB) / Ishwar Industries/ Swastika/Wesman
	Electrical Motors	ABB / Seimens / KEC / Crompton
3.0	Burners	Wesman (North America) / Vulcan / Bloom Engg./ Equivalent
4.0	Pneumatic Cylinders	Veljan Hydrair / Schrager / Electro Pneumatic
5.0	Gear Boxes	Elecon / New Allenberry / Shanthi
6.0	Instrumentation	
	Thermo-couples / RTDS	Rajput / Toshniwal / General Instruments / Pyrotech
	Control Valves	Fouress / J N Marshall / BHEL
	Electric Actuators	Marsh Engg. / Honeywell / Ranutrol / Johnson Control
	Micro process based PID Controllers	Taylor / Honeywell / Eurotherm / ABB

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	Temperature & Pressure recorders	Honeywell / Eurotherm / Chino / Toshniwal / ABB
	Pressure Flow / DPT Temperature transducers	Taylor / Rosemount / Honeywell / ABB
	Solenoid Valves	Avcon / Blue Star / Rotex
	Pressure Gauge	H-Guru / Fiebig / Protech
	Pressure, Flow, temperature Switches	Switzer / Indfoss / Toshniwal
7.0	Electrical Components	
	Circuit Breakers / Isolators SFUs	Siemens / L&T / Schneider / ABB
	Starters	Seimens / L&T / ABB / Schneider
	Contractors	Seimens / L&T / Schneider
	Overload Relays	Seimens / L&T / Schneider
	Push Buttons	Seimens / L&T / Schneider
	Control / Selector Switch	Kaycee / L&T / Schneider
	MCBs	MDS / Schneider
	MCCB	L&T / ABB / Schneider
	Meters (Ammeter, Voltmeter, P F Meter)	IMP / AE
	Indicating Lamps	Seimens / Tekmic
	HRC Fuses	L&T / Seimens
	PVC Cables	CCI / Poly Cab / Finolex / Universal
	Proximity switches & Limit Switches	BCH / PC Electronics / Tekmic
	PLC	Seimens / ABB / Allen Bradley



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Annex – IIb

ELECTRICAL SPECIFICATIONS FOR COAL GASIFIER



1.0 GENERAL CLAUSES AND INSTRUCTIONS

- 1.1. All the cables used for power distribution will be Armoured Copper cable and all the Control cables will be multicore flexible cables as per requirement.
- 1.2. Earthing wire is to be distributed separately and it should be green colour pvc insulated of mentioned specifications according to load rating.
- 1.3. All the motor starters will be located in Centralised Motor Control Centre (MCC) adjacent to DG room and power cables and cables for remote station (Start – Stop – Forward – Reverse) will run from MCC to Load.
- 1.4. The work shall be carried out by the successful bidder on a complete turnkey basis for the above mentioned facilities with his own supervisors, technicians, tools and tackles, erection material and equipment. All the work shall be carried out skilled work men holding valid licenses.
- 1.5. All the equipment shall be designed as per applicable standard and codes of practice furnished by Bureau of Indian standard (BIS); Indian Electricity Rules & statutory requirements of Central Government and State Govt. and where relevant IS is not available, IEC standards shall be followed.
- 1.6. The Bidder shall study the details and technical particulars given in this Tech. Specifications satisfy him self regarding the suitability of the equipment offered for the required duty / application. The Bidder shall stand guarantee for the satisfactory and reliable control operation and performance of the equipment offered by him.
- 1.7. The cost of commissioning spares required for successful erection, testing and commissioning shall be built up in the quotation submitted by the Bidder.
- 1.8. The Bidder shall be responsible for total detailed engineering including preparation of specification drawings, civil assignment drawings, working drawings; equipment layouts, erection drawings etc.
- 1.9. The Bidder shall visit site and satisfy himself in all respects with site conditions before quoting. After acceptance of tender, no claim for extra

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payment submitted by the Bidder on ground of any local working or site conditions will be considered.

- 1.10. Bidder shall obtain approval / clearance from electrical Inspector / factory inspector, statutory governing bodies etc. for installation / erection work done by him.
- 1.11. Any additional equipment / item which might have not been specifically mentioned in this T.S. but is necessary for achieving specified performance; control & completeness of the system shall be provided by the successful Bidder without any extra cost and within the time schedule.
- 1.12. Damage to painting suffered during transit / erection shall be made good by the contractor free of cost before its equipment is accepted by the Purchaser / Client.
- 1.13. The contractor keep his working site / work place neat & clean after completion of the sire work; the contractor shall clean the site thoroughly and shall not leave any debris, unwanted material etc. at site.
- 1.14. Bidder shall also quote and recommend a list of operation of maintenance spares for all equipment for 2 years considering the fact that the subject plant is not for regular production but shall be part in operation occasionally for investigations. This plant is basically for Demonstration and so minimum spares shall be recommended.
- 1.15. Construction power and water required at site shall be arranged by the successful Bidder at his own cost.
- 1.16. Material brought to the site shall not be removed from the site without the written consent of the purchaser.
- 1.17. The Bidder on award of contract shall submit a detailed program of work and Bar chart within two weeks so that the same shall be approved by the purchaser.
- 1.18. First fill of for all consumables (lubricants, spares etc) and any additional amount required up to the handing over of the plant is included in the Bidder's scope.
- 1.19. During detailed engineering the successful Bidder shall furnish civil assignment drawings indicating the embedded walls floor inserts, dimensions of the concrete channels for cables for enabling preparation of proper civil drawings. Pipe trenches, equipment foundation details shall also be indicated in the civil assignment drawings with static and dynamic loading of the equipment and rotating machines.
- 1.20. Sundry civil works (e.g. chipping, drilling holes on walls, digging etc) required for Bidder's own erection job is included in the scope.

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- 1.21. The successful Bidder shall take full responsibility for completion of the job and putting the system in smooth operation in an integrated manner. The contractor shall work at site in close interaction / coordination with other agencies responsible for other facilities.
- 1.22. Exclusions and deviations, if any, from the Tender specifications, shall be put at in the offer and with reasons; otherwise the same may not be considered.

2. SYSTEM DESCRIPTION AND SCOPE OF WORK

- 2.1. This is a general description for the Bidder to understand location, operation & scope of work relating electrics.
- 2.2. The normal power supply at 415V AC, 3- ϕ , 50 HZ, 4-Wire shall be made available from a Main Diesel Generator Set of rating **380 KVA**, located in a room (S.No 6 of the Equipment layout) in the plant for plant operation.
- 2.3. There shall be one auxiliary DG Set of rating **25 KVA** in the same room exclusively for illumination of the whole plant including ventilation and for driving motors of underground water pumps.
- 2.4. There shall be one electrical control room (ECR) adjacent to D.G. room. PMCC housing feeders and controls for different drives shall be located inside air-conditioned ECR. The lighting panel and other related electrical panels (E.M. brake panels; rotor resistance boxes etc if any depending upon final drive list) shall also be located inside ECR.
- 2.5. The Isolation and protection cabinets pertaining to Roller table motors shall be located in shop floor. These cabinets will be stand alone desk type.
- 2.6. Operators control desks shall be located in front of the furnace roller tables.
- 2.7. The Bidder shall include in his scope all power & control cables (incoming cable, outing cable and interconnecting cables) for the electrical equipment under his scope.
- 2.8. The successful Bidder shall also include in his scope cable supply, laying & termination for the following:-

3. Incoming cables to MCC from PCC.

- 3.1. Outgoing power cables from PCC to other facilities (not under the Bidder's scope) like coal gasification unit, water pump, compressor, E.O.T. crane.
- 3.2. The successful Bidder shall be responsible for complete earthing of the plant (Ring Main earthing; grounding stations; continuous earth strip in

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ECR / DG room / shop floor and equipment earthing, columns grounding as described in the earthing chapter.

- 3.3. The successful Bidder shall also provide lightning protection to the buildings, chimneys, shop floor shed etc as per I.S.
- 3.4. The scope of supply and work for electrics shall include but not limited to the following:
 - 3.4.1. MCC, instrument panel, control desks, push button stations, I & P cabinets, MLDBs LDBs etc.
 - 3.4.2. pull boxes, junction boxes
 - 3.4.3. L.T. Power & control cables with necessary cable accessories, lugs, glands, tags, etc
 - 3.4.4. Earthing material & material for lightening protection as per T.S. civil work connected to earthing electrodes, equipment earthing, and other civil works required during erection of equipment and cabling.
 - 3.4.5. Cable trays, racks, erection material, G.I Pipe (medium grade) etc.
 - 3.4.6. Detail engineering for earthing; lightning protection, cable laying, installation of cable racks / trays; preparation specification drawings, civil assignment drawings, working drawings cable schedule etc.
 - 3.4.7. Measurement of earth resistivity for calculation of earth resistance.
 - 3.4.8. Supply of commissioning spares
 - 3.4.9. Insulating mats in front and back of all panels, first aid boxes, danger boards, shock treatment charts etc.
 - 3.4.10. Statutory authority approval / clearance for the electrical installation.
 - 3.4.11. The Bidder shall include in his scope of supply all components, material, accessories, and sundry item required to render the installation / erection fully operative in all respects even though every individual item may not have been detailed out explicitly in the T.S.

4. BASIC DESIGN DATA

Following basic design data shall be considered for design / selection of the electrical equipment & components:

- 4.1. **Site ambient condition**

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- 4.1.1. Max ambient air temperature: 50⁰C (indoor equipment) and 55⁰C (outdoor equipment)
- 4.1.2. Minimum ambient air temperature: 1⁰C
- 4.1.3. Relative humidity : 100%
(Relative humidity and max. temp will not occur simultaneously)
- 4.1.4. Climate : tropical

4.2. Standard Voltage levels

- 4.2.1 L.T. Power supply : 415 VAC ± 10%, 3-phase, 50 HZ ± 3%
(Power supply from D.G. set)

- 4.2.2 Combined voltage & frequency variation: ± 10%

4.3. Short circuit level (3-phase symmetrical)



- 4.3.1. At 415 V switch gear : 50 KA for 1 sec

4.4. Control voltage : 240 V AC + 10% obtained through control transformer

5. SPECIFICATIONS FOR MOTOR CONTROL CENTRE (MCC)

5.1. Constructional Features



- 5.1.1. MCC shall be single front, totally enclosed, compartmentalized, CRCA sheet steel fabricated, self standing, floor mounted with incomer feeder as draw out type and outgoing feeders as non-draw out type.
- 5.1.2. MCC shall be dust, damp and vermin proof and enclosure conforming to IP-54 class.
- 5.1.3. Sheet steel enclosures of MCC shall be CRCA sheet steel of thickness 2 mm minimum.
- 5.1.4. Cable entry shall be from bottom. MCC bottom shall have detachable CRCA sheet steel gland plate of thickness not less than 3.0 mm.
- 5.1.5. MCC shall have concealed hinges, feeder compartments shall be totally closed from all sides with a door on front side.
- 5.1.6. Factory built assembly in multi-tier, fully compartmentalized design, each compartment dedicated to a feeder.
- 5.1.7. Independent vertical cable alley in each panel with a minimum clear width of about 250 mm covered by hinged door.
- 5.1.8. Minimum operating height of devices on panel to be 350 mm and maximum operating height to be 1900 mm.

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- 5.1.9. Each section of MCC to be provided with removable lifting facility.
- 5.1.10. MCC shall be provided with base channel of 75 mm x 40 mm (ISMC – 75)
- 5.1.11. Module doors and cable alley doors to open in opposite direction.
- 5.1.12. To ensure good earth continuity all bolted joints shall be provided with tooth / spring washers. MCC shall have two separate earthing studs for earthing as per IE rules.
- 5.1.13. Clear, legible identification labels shall be provided for all power, control & signaling devices, panel number, module / compartment number, mechanism / system description on the compartment door etc.
- 5.1.14. Compartment door shall be interlocked with the main power isolating device with provision for defeating it by authorized person. Power circuit isolation device shall have facility for pad locking in the ‘OFF’ position with door closed.
- 5.1.15. MCC should be easily extendable at both ends with multi tier compartmental arrangement.

5.2. Bus Bars

- 5.2.1. Bus bars shall be insulated by colour coded PVC sleeves.
- 5.2.2. Removal of bus bars shall be possible without disconnecting external cables
- 5.2.3. MCC shall be designed for fault level of 50 KA for one second.
- 5.2.4. Bus bars of different voltages levels shall be fully segregated.
- 5.2.5. Copper earth bus bars of size 30 x 10 mm shall be provided along the full length of the MCC and shall have two earthing terminals. Alternatively G.I. strips of equivalent section may be provided.
- 5.2.6. Bus bars temperature rise shall be limited to 40 °C over 50 °C ambient as measured by thermometer.
- 5.2.7. Vertical bus bars of all panels to be of same size.
- 5.2.8. Copper control bus bar of minimum 25 max x 6 mm running horizontally to be provided.
- 5.2.9. All bus bars connections and bus taps to individual feeder shall be either by means of 1100V grade PVC insulated wires or links insulated with heat shrunk PVC sleeves.

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- 5.2.10. MCC shall have a suitably rated MCCB as incomer and required number of MCCB as outgoing feeders.
- 5.2.11. Incomer feeder panel shall have MCCB 50% more rated than connected load, 415V AC, 50HZ, 3- ϕ and shall be provided with C.T. operated ammeter with ASS, voltmeter with VSS & protection fuses, RYB phase indication and ON, OFF, trip lamps with fuse protection.
- 5.2.12. Outgoing motor feeders shall be provided with following components:
- 5.2.12.1. Moulded case circuit breaker provided with requisite protections as per application.
 - 5.2.12.2. Power contractor AC3 & duty / AC4 duty as applicable (Reversible contactors with mechanical & electrical interlocking for reversible drives)
 - 5.2.12.3. Hand reset separately mounted over load relays with built in single phasing prevention facility and resetting push button. For motors of 110 KW rating and above (if any) comprehensive motor protection relay (MPR) shall be provided.
 - 5.2.12.4. C.T. operated ammeter for motors of 15 KW & above
 - 5.2.12.5. ON (Fwd & Rev), OFF, O/L trip indication lamps. O/L trip indication will be taken from an auxiliary contractor operated by O/L relay (Micro Processor based).
 - 5.2.12.6. 2 – pole MCB (9 KA S.C. capacity) in each motor feeder control circuit
 - 5.2.12.7. Test P.B. for testing power contactor with main circuit disconnected
 - 5.2.12.8. A set of auxiliary contactors for sequencing, interlocking and annunciation
 - 5.2.12.9. Other equipment / components as required according to final approved circuit diagram.
 - 5.2.12.10. Thermal O/L relay / magnetic O/L relay (Microprocessor based) with time delay features shall be provided in the power circuit as applicable.



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- 5.2.12.11. All equipment and components shall be neatly arranged and shall be easily accessible for easy operation and maintenance.
- 5.2.12.12. MCCB, contractor and O/L relays shall be selected to ensure type – C co-ordination a per IEC – 292 – 1A (Type – 2 as per IEC – 947 – 1)
- 5.2.12.13. Control transformer shall be rated for full capacity of MCC including spare feeders and auxiliary contactors plus 20% additional spare capacity.
- 5.2.12.14. The control transformer shall be double wound dry type, self ventilated with tapping + 2.5% and + 5% at primary side.
- 5.2.12.15. All MCCB feeders (Non-motor feeders) shall be provided with ‘ON’ and ‘OFF’ indicating lamp and CT operated ammeter with 4-positions ASS as required.
- 5.2.12.16. Internal control circuit wiring shall be with 1.1 grade, single core PVC cables with copper conductor of 2.5 sq. mm.
- 5.2.12.17. Control wiring shall be laid in plastic troughs with covers or neatly bunched and cleated with no joints.
- 5.2.12.18. Not more than two connections shall be done at any one terminal. All wiring shall be accessible from front.
- 5.2.12.19. 20% spare terminals shall be provided in each compartment.
- 5.2.12.20. All spare contacts shall be wired up to the terminal block.
- 5.2.12.21. 20% spare feeders (equipped) and fully wired up shall be provided in MCCs.

5.3. Major components in MCC

5.3.1. Motor Protection Moulded case circuit breakers



- 5.3.1.1. Shall be complete with thermal and magnetic release selected so as to allow trouble free starting of the motor.
- 5.3.1.2. Features to minimise the let-through energy (I^2t) in the event of short circuit on load side.

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- 5.3.1.3. Motor protection MCCB selection suitable for fault level at the point of application. No fuse back up is acceptable.
- 5.3.1.4. Provided with minimum 1 No + 1 NC aux. Contacts for indication purpose.
- 5.3.1.5. MCCB shall be provided with shunt trip coil wherever required (particularly in case of torque motors) for tripping of MCCB due to the tripping command given by motor protection thermister relay.
- 5.3.1.6. Ratings of MCCB selected shall be at least 125% of the full load current of the motor.

5.3.2. **Magnetic Contactors**

- 5.3.2.1. Shall conform to IEC-947-4 (1990)
- 5.3.2.2. Shall be capable of interrupting ten times the rated current for rated sizes up to 100 A and eight times the rated current for larger sizes.
- 5.3.2.3. Suitable to carry the prospective short circuit currents without damage of injurious heating till the protective device operates.
- 5.3.2.4. Coil shall be designed for A.C. No economy resistors to be used.
- 5.3.2.5. Insulation of coils shall be Class `E` or better.
- 5.3.2.6. Shall pick up positively at voltage between 85% to 110% of rated value.
- 5.3.2.7. Drop out shall be between 75% and 40% of rated value.
- 5.3.2.8. All contactors shall be AC3 duty for all continuously rated drives. The contactor rating (AC3 duty) shall be minimum 125% of rated FLC of the motor and 150% minimum in case of fan motor and other high inertia loads as well for inching duty and frequently reversing duty.
- 5.3.2.9. AC4 rating contactors shall be selected for inching and plugging operation of the drive.
- 5.3.2.10. Minimum 2 No + 2 NC auxiliary contacts with minimum rating 10A, 415V for rated duty AC-11 and 2A , 220V for rated duty DC-11.
- 5.3.2.11. DC contractors shall be provided with adequately rated magnetic blow out coil for effective arc quenching.

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5.3.2.12. For reversible drives, mechanical as well as electrically interlocked contactors shall be used.

5.3.3. Thermal overload relay

5.3.3.1. Shall be triple pole, ambient temperature compensated, inverse time log, hand reset type bi-metallic with adjustable setting.

5.3.3.2. The Thermal O/L relay shall conform to IEC – 292 - 1

5.3.3.3. At least one make and one break contact (1 No + 1 NC) with ratings same as for auxiliary contact of the contactors.

5.3.3.4. Shall have built in single phasing protection unit.

5.3.3.5. The relay shall be able to withstand prospective short circuit current without damage or injurious heating till the motor protection MCCB clears the S.C. fault.

5.3.3.6. Auto tripping shall be indicated on the MCC.

5.3.3.7. The O/L relay range shall be 70% to 120% of circuit full load current. No nuisance tripping during starting shall be ensured.

5.3.3.8. Heavy duty C.T. operated O/L relays shall be provided for drive having high starting time like fans and other high inertia drive as required.

5.3.4. Magnetic Overload Relay

5.3.4.1. Triple pole, adjustment time lag feature or of instantaneous type.

5.3.4.2. Provided with a latch and hand reset feature or auto reset with flag indication.



5.3.4.3. At least 1 No + 1 NC auxiliary contacts, ratings same as aux. Contacts of the contactors.

5.3.4.4. Adjustable current setting and time delay calibrated between nominal current and twice nominal current ratings.

5.3.5. Thermister Protection

5.3.5.1. Thermisters to be provided for roller table motors through 3 PTC thermisters embedded in the stator in its hot spot region to provide protection against overheating.

5.3.5.2. Thermisters generally conform to BS-4999 (Part-72). The reference temperature shall be chosen in accordance with

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the class of insulation used for the motor winding, taking into account adequate safety margin.

5.3.5.3. PTC with sharp knee characteristics and high signal to noise ratio.

5.3.5.4. NC contact of thermisters signal processing unit which opens in case of temp. rise in motor winding shall be utilized in motor starter circuits.

5.3.6. **Current transformers**

5.3.6.1. Bar type primaries and 5A (max) secondaries with thermal and dynamic ratings corresponding to the units, with which they are used.

5.3.6.2. Measuring CT accuracy class 1.0

5.3.6.3. Protective CT accuracy class 10 P 10

5.3.6.4. Conform to IS: 2705 - 1992

5.3.7. **Voltmeters and Ammeters (Digital)**

5.3.7.1. Shall not damage by passage of fault current or existence of over voltage for the maximum permitted duration of fault condition.

5.3.7.2. Flush mounting, square dial

5.3.7.3. Accuracy class 1.5

5.3.7.4. Ammeters for drives above 15 KW shall be C.T. operated

5.3.7.5. Voltmeters protected by fuses placed as close to the bus bar as possible.

5.3.7.6. Maximum reading 600% of FLC for motor feeders.



5.3.7.7. Size of voltmeter & Ammeter for incomer 144 x 144 mm

5.3.7.8. Size of Ammeter for motor feeders 72 x 72 mm

5.4. **Specifications for Power circuit isolation & protection cabinets**

5.4.1.1. Isolation & protection cabinets are required for individually driven roller table motors. One cabinet for one group of roller table motors shall be considered.

5.4.1.2. Each of these cabinets shall have one incomer isolator MCCB for the group and outgoing feeder MCCB for each motor in the group and thermister protection relay one for each motor with red indicating lamps for motor tripping.

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5.4.1.3. These cabinets shall be fabricated from CRCA sheet steel of thickness not less than 2 mm with bottom detachable gland plate of thickness 3 mm minimum.

5.4.1.4. The enclosure shall be dust & vermin proof, well gasketed with hinged door in the front; class of protection I P – 54

5.5. Control desks

5.5.1. The control desk shall be located in front of walking hearth furnace for control operation of roller tables, billet pusher / billet extractor etc.

5.5.2. The control desk shall house master controllers, indicating lamps, selector switches and other control devices as per operational requirement.

5.5.3. The control desk shall be CRCA sheet steel (of thickness 3.00 mm minimum) free standing, floor mounted, dust & vermin proof with high quality non-deteriorating rubber gasketing degree of protection IP-54; assembled on base channel of IS MC 100, with removable lifting arrangement, with cable entry from bottom having 3 mm thick gland plate (Undrilled & removable) having facility to keep the hinged top cover of the desk in open position for maintenance and inspection and with interior painted white to enhance illumination

5.5.4. Control desk shall have slanted top, bolted covers on the sides & bottom concealed hinged door on the rear and front be provided.

5.5.5. Internal wiring of the desk by 1.1 KV grade PVC insulated, single core copper flexible wire of cross section 2.5 sq. mm.

5.6. Local control push button stations

5.6.1. One (1) set wall mounted push button stations as required shall be considered and supplied by the Bidder for local operation of some of the drives / system.



5.6.2. The Push button station shall be made of CRCA sheet steel of thickness not less than 2.00 mm and bottom gland plate of thickness not less than 3.0 mm.

5.6.3. The degree of protection for enclosure shall be IP – 55

5.6.4. P.B. station shall be weather, dust & vermin proof, wall mounted type provided with requisite number of push buttons, switches, indicating lamps, meters and other control devices required as per operational requirement.

5.6.5. It will have hinged lockable front door.

5.6.6. “Start” PB shall be green colour shrouded type with 1 No + 1 NC contacts (minimum) or as per final circuit diagram.

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- 5.6.7. “Stop” PB shall be red colour, un-shrouded type with 1 No + 1 NC contact (Minimum) or as per final circuit diagram.
- 5.6.8. “Emergency Stop” P.B. shall be red colour mushroom headed lockable type (Press to lock and turn to release type)
- 5.6.9. Wiring with extra flexible wires and the wire size shall be 2.5 sq. mm copper, PVC insulated.
- 5.6.10. 20% spare terminals shall be provided

5.6.11. JUNCTION BOXES

- 5.6.11.1. The junction boxes shall be dust and vermin proof and made of pressed sheet steel having minimum thickness of 3 mm & with rubber gasket at all joints and openings. The JB will contain suitable type and number of terminals including 20% spare terminals for terminating cables. JB shall be weather proof.

6. CABLES

6.1. LT Power Cable



- 6.1.1. L.T. power cable shall be heavy duty PVC insulated & PVC sheathed armoured, 1100 grade multi core stranded with Copper conductor cable conform to IS-1554 Part – I latest amendment.

6.2. LT Control Cable

- 6.2.1. L.T. control cable shall be heavy duty PVC insulated & PVC sheathed armoured, 1100 grade, multi core, stranded with copper conductor cable conform to IS-1554 Part–I (latest amendment).

6.3. Design criteria for cable sizing



- 6.3.1. The L.T. power cables shall be selected on the basis of current carrying capacity, short circuit rating and permissible voltage drop.
- 6.3.2. The minimum cable size for L.T. Power cable shall be 2.5 sq.mm Copper and minimum size of control cable shall be 1.5 sq.mm copper.
- 6.3.3. Current carrying capacity: The cable shall be able to carry the full load current of the circuit and rated full load current of the motor under specified ambient temperature and other condition of installation. For this a suitable derating factors for laying conditions as listed below shall be considered.
- 6.3.4. Ambient ground / air temperature
- 6.3.5. Depth of laying and conditions of laying
- 6.3.6. Grouping of cables

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- 6.3.7. Other applicable site requirements.
- 6.3.8. A derating factor of 0.55 shall be considered on account of all the above factors while selecting the power cable and selected cable rating shall also be checked for voltage drop to ensure that the same is within the permissible limits.
- 6.3.9. Permissible voltage drop / dip
- 6.3.10. During running the voltage drop in cable from main 415V switch gear / D.G. set to PMCC panel and from the PMCC to the motor terminals and other consumers shall be limited to 5%
- 6.3.11. Voltage dip during starting of any individual motor shall be limited to 15%.
- 6.3.12. In multi core control cables the following minimum reserve cores shall be kept : (a) Upto 7 cores - One reverse core, (b) Upto 10 cores - Two reverse core, (c) Upto 24 cores - Three reverse core
- 6.3.13. Note: After the motor list is finalized by the successful Bidder, the size of power cables selected along with voltage drop calculations shall be furnished by the Bidder during detail engineering for purchaser's approval.

6.4. Cable installation

- 6.4.1. Cables shall be laid on Perforated / Ladder type covered GI cable trays on over head structure from D.G. set room / Electrical control room to different electrical equipment / drives.
- 6.4.2. All cable irrespective of type of installation shall be protected by means of G.I. pipe or sheet metal protective cover up to a height of 2000 mm from the working floor level and platform for protection against mechanical damage.
- 6.4.3. Cable runs shall be uniformly spaced properly supported and protected in an approved manner. All bends in runs shall be well defined and made with due consideration to avoid sharp bending and kinking of cables. The bending radius of multi core cables shall be 15 D for H.T. cable and 12 D in case of L.T. Power cable.
- 6.4.4. No joints shall be made at any intermediate point in through runs of cables. In case where jointing is unavoidable the same shall be made after the approval of purchaser by means of standard cable jointing kit.
- 6.4.5. L.T. power cables shall be laid on separate tray in one layer touching each other.



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- 6.4.6. Multi core control cables shall be laid in one or two layers touching each other on the cable trays depending upon number of cables and cable trench depth.
- 6.4.7. All cables shall be properly clamped, tagged and feruled.
- 6.4.8. Supporting brackets (cable tracks) for cable trays shall be provided at an interval not exceeding 1500 mm. Vertical spacing between trays generally shall be 250 mm / 300 mm depending upon type of cable LT / HT.
- 6.4.9. Cable racks shall be fabricated from MS angle of size 50 x 50 x 6
- 6.4.10. Cable trays shall be fabricated out of 2 mm rolled mild steel sheet.
- 6.4.11. Ladder type cable trays shall consist of side rails formed to channel shape and horizontal slotted ladder rungs with 250 mm spacing center to centre. These cable trays have standard clear inside width of 300 mm, 450 mm, 600 mm and 1000 mm etc. with standard length of 2500 mm.
- 6.4.12. Ladder type cable tray can also be fabricated from MS angle 50 x 50 x 5 mm (forming side rails) and ladder rungs (formed for MS flat 25 x 3 mm) can be welded to the rails.
- 6.4.13. Alternatively standard pre-fabricated perforated cable trays may be used.
- 6.4.14. All cable trays and cable racks along with their fittings shall be hot dip galvanized.
- 6.4.15. Where cables are required to cross roads, railway tracks and surface drains they shall be taken through reinforced concrete spun pipes encased in concrete block at a depth of 800 mm. Spun pipes shall be extended at least 1.5 meter each edge of the road / railway track etc.
- 6.4.16. (m) In out door areas where cables are taken buried in ground, the following procedure shall be followed:
- 6.4.17. Depth of the trench shall not be less than 800 mm. The width of the cable trench shall be decided based on the number of cables to be laid. Spacing between two cables in any trench shall not be less than 150mm. Cables shall be laid in one layer. Before laying cables in trench, a bed of sand of 100 mm depth shall be prepared at the bottom of the trench. The cables shall be laid on this bed. Further to that another layer of sand shall be formed to a level of 100 mm from the crest of the largest dia cable. Then a layer of bricks shall be placed on the top of the sand layer and there after back filling, levelling of the trench shall be done.

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7. EARTHING

- 7.1. Entire system shall be earthed in accordance with the provision of the relevant IEC recommendations / IS code of practice IS 3043 and Indian Electricity Rules; so that the values of the step potential and contact potentials in case of faults are kept within safe permissible limits.
- 7.2. Parts of all electrical equipment and machinery (not intended to be alive) shall have two separate and distinct earth connections each to conform to the stipulation of the Indian Electricity Rules and apparatus rated for 240V and below may have single earth connection.
- 7.3. For the purpose of dimensioning the earthing lines / conductors, the duration of the earth fault current shall be taken as 0.3 seconds.
- 7.4. A continuous earth strip shall be run in each cable channel. Earth strip shall be laid along the lengths of cable trays and the trays are earthed at every 3 m interval with the above earth strip.
- 7.5. The minimum size of galvanized MS Flat / wire for earthing of various equipment / system shall be as follows :
 - 7.5.1. Main earth ring around Electrical room / Generator room / pump house etc: 75 x 10 mm
 - 7.5.2. Earthing leads connected between main earth ring and the earth electrodes: 75 x 10 mm
 - 7.5.3. Localised ground mat laid inside / around the premises: 65 x 8 mm
 - 7.5.4. Earth continuity conductor connection (vertical riser) between main earthing ring & localized ground mat: 65 x 8 mm
 - 7.5.5. MCC / LT switch boards / MLDB: 50 x 6 mm
 - 7.5.6. AC motors 90 Kw and above: 50 x 6 mm
 - 7.5.7. Motors from 45 kw and below 90 kw: 40 x 6 mm
 - 7.5.8. Motors from 15 kw and below 45 kw: 25 x 6 mm
 - 7.5.9. Motors from 3.7 kw up to 11 kw : 16 Sq.mm stranded G.I.wire
 - 7.5.10. Motors below 3.7 kw / local push button stations / junction boxes / limit switches etc: 6 sq.mm stranded wire
 - 7.5.11. Control desk / cabinets / distribution board / instrument panels / relay panel etc: 25 x 3 mm flat
 - 7.5.12. Isolator / MCCB and socket outlets above 16 A up to 100 A: 50 sq.mm stranded G.I. wire

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- 7.5.13. For earthing of building columns, crane, rails etc: 50 x 6 mm
- 7.5.14. Earthing Electrode: Buried earthing electrode shall be G.I. pipe 50 mm dia and 4 mm thick and 3 M long in one piece provided with water holes.
- 7.6. Separate earthing system shall be provided for the electronic equipment and system as recommended by the manufacturer.

8. PAINTING



- 8.1. All sharp edges and scales shall be removed from the surface, which shall then be thoroughly degreased, and derusted.
- 8.2. Equipment shall be painted by power coating and backing process to withstand heavily polluted environment.
- 8.3. Equipment shall receive two coats of anti rust paint before coating with two coats of final paint.
- 8.4. Paint shall be EPOXY, glossy, light grey finish shade No. 631 of IS-5.

9. INSPECTION & TESTING

- 9.1. All electrical equipment / items, e.g. motors, MCC panels; control desks, push button stations; cable etc shall be fully tested in accordance with the relevant IS / IEC
- 9.2. Routine tests as per relevant standards shall be carried out on all the electrical items at manufacturer's works in presence of the purchaser / his representative thereafter test certificate shall be submitted.
- 9.3. Type test certificate for motor air circuit breakers, contactors etc of similar rating as demanded by the purchaser shall be submitted.
- 9.4. Electrical equipment / items shall be dispatched only after test certificates are accepted and dispatch clearance is given by the purchaser.
- 9.5. Quality assurance plan (QAP) for inspection and tests of electrical equipment / items shall be submitted by the contractor for purchaser's approval prior to manufacturing

10. ERECTION, TESTING & COMMISSIONING



- 10.1. The contractor shall be fully responsible for the satisfactory erection / installation testing and commissioning of all the electrical equipment under his scope including cable laying & termination, earthing etc. The installation shall be carried out in line with the Indian Electricity Rules and Indian Standards. The installation shall also conform to the requirements of the electrical inspectorate of the state government.

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- 10.2. The contractor shall provide all skilled, semi-skilled or unskilled labour, riggers, certified welders, pipe fitters, electrical fitters, licensed electricians, licensed cable jointers, licensed electrical supervisors, mechanics as well as erection and testing engineers.
- 10.3. The electrical installation shall be carried out by an electrical subcontractor holding a valid license issued by the State government for carrying out the installation work of the voltage classes involved under the direct supervision of and by a person holding a valid certificate of competency for the same voltage classes recognized by the state government.
- 10.4. The work shall be executed in a professional workmanship manner.
- 10.5. Clamps, brackets, bolts, nuts, markers, ferrules, lugs, glands, & MS angle MS channels, packing plate, brass shims and other hardware necessary for erection work shall be included in contractor's scope.
- 10.6. All tools, tackle, instruments, material handling equipment for transportation, mobile cranes, welding sets, gas cutting equipment, crimping tool, drill machines, level gauges etc shall be arranged by the contractor for carrying out erection commissioning work.
- 10.7. All tests shall be carried out at site by the contractor using his own testing instruments having valid calibration certificates as well as qualified testing personnel.
- 10.8. Supply and erection of first aid boxes, fire extinguishers, sand buckets, shock treatment charts, rubber mats, danger boards etc. as per electricity rules and as per requirement for the premises of the plant.
- 10.9. It is the total responsibility of the contractor to ensure completeness of the job as per T.S. on turn key basis for supply, erection, testing & commissioning and handing over the plant to the full satisfaction of the purchaser / client

11. INFORMATION / DRAWINGS DOCUMENTS TO BE FURNISHED

- 11.1. **Information / data / drawings to be submitted along with the tender**
 - 11.1.1. Drive list
 - 11.1.2. Bill of quantities (B.O.Q.)
 - 11.1.3. Single line diagrams with power and control components rating, type, make current setting etc.
 - 11.1.4. Electrical equipment layout in DG Room, ECR and shop floor with proposed cable routing.
 - 11.1.5. Technical catalogues



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- 11.1.6. Equipment and panel dimensions
- 11.2. **Information / data / drgs / documents to be submitted for reference / approval in requisite copies after award of contract**
- 11.2.1. List of drawings / documents / technical data with Sl.No. description, drgs / document No.; category (Reference / Approval) and date of submission.
- 11.2.2. Basic plant data sheet
- 11.2.3. Single line diagrams with component ratings, settings range etc.
- 11.2.4. Circuit diagrams
- 11.2.5. Certified general arrangement drgs of electrical equipment / panels with dimensions weight, sectional views, foundation / mounting details etc.
- 11.2.6. Civil foundation drgs.
- 11.2.7. Facia drgs of panels
- 11.2.8. Bill of quantities with type ratings, make, technical data, etc of electrical equipment / panels components.
- 11.2.9. Power and control cable schedule
- 11.2.10. Voltage drop calculations
- 11.2.11. Electrical equipment layout drgs inside DG Room, ECR and shop floor
- 11.2.12. Earthing layout & layout of lighting protection system with calculations.
- 11.2.13. MCC bus bar sizing calculations
- 11.2.14. Conduit and cable routing drgs with cable racks / trays details
- 11.2.15. Interconnection & terminal plan drgs
- 11.2.16. Equipment test certificates
- 11.3. O & M manual
- 11.4. Technical categories
- 11.5. Any other information / drgs / documents as felt necessary by the purchaser for the project.
- 11.6. All the necessary certificates from Legislative bodies complying electrical safety act & Pollution Control Act.

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11.7. AS BUILT DRAWINGS

- 11.7.1. Upon installation & commissioning, supplier shall incorporate revisions / modification, if any done at site in the reproducible or tracings and submit the same as “As Built Drawings” for purchaser’s record in two sets of all the final drawings / documentation etc.
- 11.7.2. After correction final floppies submitted (2-sets) for as built drawings.
- 11.7.2.1. LIST OF DRAWINGS ENCLOSED
- 11.7.2.2. A typical electrical single line diagram considering individually driven roller table motors along with other feeders is prepared and enclosed, only for the general guidance of the Bidder so that the Bidder can have an idea about the scheme / operational requirement.
- 11.7.3. Ratings (KW / Ampere / volts etc) indicated in SLD is tentative only and may undergo change depending upon the offers received from the Bidders and also during detail enquiry.
- 11.7.4. However, the Bidder shall offer the electrical equipment controls etc. best suited for the application and meeting the operational requirement.



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PREFERRED MAKES OF EQUIPMENT

S.No	Material	Make
1.0	Diesel Engine	Cummines /Greaves Cotton / Caterpillar / KEC
2.0	Alternator	Stamford / KEC / NGEF / Crompton
3.0	L.T. Air circuit breaker	Siemens / L & T Schneider
4.0	Motor Control center	Siemens / Schneider / ABB / L & T
5.0	Moulded case circuit breakers	Schneider / Siemens / L&T
6.0	A.C. Motors	ABB / Siemens / C.G.L. / Bharat Bijlee / KEC
7.0	Geared Motors	BAVR / KEC / SEW / Power Build / GYROX / New Allen Berry.
8.0	Control Desks, P.B. stations PDGS, LDBS, terminal boxes	Siemens / L & T / Schneider
9.0	A.C. Power contactors & Aux relays	Siemens / L & T / Schneider
1	Miniature circuit breakers	MDS / Siemens / HAVELS / Schneider
2	Thermal O/L relays	Siemens / L & T / Schneider
3	Electro magnetic O/L relays	Siemens / L & T / Schneider
4	Control transformer	Indcoil / Siemens / AE / BCH
5	Current transformer	AE / KAPPA
6	PVC cables	CCIL / Universal / INCAB / NICCO / KEI / Fort Gloster
7	E.M. brakes	BCM / KAKKU / Electromag
8	Push buttons	Siemens / L & T / VAISHNO / Schneider
9	Voltmeter / Ammeter / watt meters	Enercon / HPL SOCOMEC / AE

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10	Terminal block	Elmex / connect well / Essen / Phoenix
11	Cable lugs	DOWELLS / COMMET / KLIPTON
12	Indicating lamps	Siemens / Scheneider / L & T
13	Double compression cable gland	CCI / Electromag / COMMET / PHONIX
14	MLDB/LDB/SLDB	Siemens / L&T / Scheneider
16	MCCB	Scheneider / Siemens / L&T
17	MCB	MDS / Siemens / Havells
18	Switch socket outlet	Havells / C.G.L / Best & Crompton
19	Control cables	Finolex / Havells / Nicco

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Annex - III

GENERAL CONDITIONS OF CONTRACT FOR GOODS

1. LEGAL STATUS

The Contractor shall be considered as having the legal status of an independent contractor vis-à-vis PMC. The Contractor's personnel and sub-contractors shall not be considered in any respect as being the employees or agents of PMC or Ministry of Steel (MOS) / UNDP. The Project Management Cell will not be a principal employer in any of the circumstances.

2. SOURCE OF INSTRUCTIONS

The Contractor shall neither seek nor accept instructions from any authority external to PMC in connection with the performance of its services under this Contract. The Contractor shall refrain from any action which may adversely affect PMC or the MOS/UNDP and shall fulfill its commitments with the fullest regard to the interests of PMC.

3. CONTRACTOR'S RESPONSIBILITY FOR EMPLOYEES



The Contractor shall be responsible for the professional and technical competence of its employees and will select, for work under this Contract, reliable individuals who will perform effectively in the implementation of this Contract, respect the local customs, and conform to a high standard of moral and ethical conduct. Contractors will follow labour law including Employee Provident Fund etc of the laborers. He will be liable to pay the Provident Fund to the labourer(s) engaged by him and will defend himself or deposit in case of Provident Fund demand by the concerned authority. In case of default, PMC will keep certain amount as an advance guarantee for the Employees Provident Fund payment or if the Project Management Cell is forced to pay under the given circumstances.

4. ACCEPTANCE OF THE PURCHASE ORDER

This Purchase Order may only be accepted by the Supplier's signing and returning an acknowledgement copy of it or by timely delivery of the goods in accordance with the terms of this Purchase Order, as herein specified. Acceptance of this Purchase Order shall effect a contract between the Parties under which the rights and obligations of the Parties shall be governed solely by the terms and conditions of this Purchase Order, including these General Conditions. No additional or inconsistent provisions proposed by the Supplier shall bind PMC unless agreed to in writing by a duly authorized official of PMC.

5. TERMS OF PAYMENT

- I. 10 % of the contract price within 30 days of signing of contract against Bank Guarantee

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- II. 80 % of the contract price after delivery, commissioning and testing of goods
- III. 10 % after the completion of warranty period or against submission of Bank Guarantee for warranty period

6. PAYMENT

- 6.1 PMC shall, on fulfillment of the Delivery Terms, unless otherwise provided in this Purchase Order, make payment within 30 days of receipt of the Supplier's invoice for the goods and copies of the shipping documents specified in this Purchase Order.
- 6.2 Payment against the invoice referred to above will reflect any discount shown under the payment terms of this Purchase Order, provided payment is made within the period required by such payment terms.
- 6.3 Unless authorized by PMC, the Supplier shall submit one invoice in respect of this Purchase Order, and such invoice must indicate the Purchase Order's identification number.
- 6.4 The prices shown in this Purchase Order may not be increased except by express written agreement of PMC.
- 6.5 In case erection / commissioning gets delayed for reasons beyond contractors control, PMC shall release 50% payment of invoice amount alongwith 100% taxes and duties.

7. SUBMISSION OF SCHEDULE OF ACTIVITIES



The contractor shall submit the detailed schedule of activities for completion of the assignment within 2 weeks from the date of LOI to PMC for approval.

8. FITNESS OF GOODS/PACKAGING

The Supplier warrants that the goods, including packaging, conform to the specifications for the goods ordered under this Purchase Order and are fit for the purposes for which such goods are ordinarily used and for purposes expressly made known to the Supplier by PMC, and are free from defects in workmanship and materials. The Supplier also warrants that the goods are contained or packaged adequately to protect the goods.

9. INSPECTION

- 9.1 PMC will depute designated personnel / authorized inspection agencies for inspecting plant and equipment in supplier premises both for indigenous and imported goods.
- 9.2 Alternatively, PMC shall have a reasonable time after delivery of the goods to inspect them and to reject and refuse acceptance of goods not conforming to this Purchase Order; payment for goods pursuant to this Purchase Order shall not be deemed an acceptance of the goods.

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9.3 Inspection prior to shipment does not relieve the Supplier from any of its contractual obligations.

10. LIQUIDATED DAMAGES

If the supplier fails to deliver any or all of the good or to perform the services within the period (s) specified in the contract, the purchaser shall, with prejudice to its other remedies in the contract, deduct from the contract price, as liquidated damages. Liquidated damages shall not exceed 0.5% per week, and the maximum shall not exceed 5% of the contract price. Once the maximum is reached, the purchaser may consider termination of the contract.

11. SUB-CONTRACTING

In the event the Contractor requires the services of sub-contractors, the Contractor shall obtain the prior written approval and clearance of PMC for all sub-contractors. The approval of PMC of a sub-contractor shall not relieve the Contractor of any of its obligations under this Contract. The terms of any sub-contract shall be subject to and conform with the provisions of this Contract.

12. OFFICIALS NOT TO BENEFIT



The Contractor warrants that no official of PMC has received or will be offered by the Contractor any direct or indirect benefit arising from this Contract or the award thereof. The Contractor agrees that breach of this provision is a breach of an essential term of this Contract.

13. INDEMNIFICATION

The Contractor shall indemnify, hold and save harmless, and defend, at its own expense, PMC, its officials, agents, and employees from and against all suits, claims, demands, and liability of any nature or kind, including their costs and expenses, arising out of acts or omissions of the Contractor, or the Contractor's employees, officers, agents or sub-contractors, in the performance of this Contract. This provision shall extend, inter alia, to claims and liability in the nature of workmen's compensation, products liability and liability arising out of the use of patented inventions or devices, copyrighted material or other intellectual property by the Contractor, its employees, officers, agents, or sub-contractors. The obligations under this Article do not lapse upon termination of this Contract.

14. ENCUMBRANCES/LIENS

The Contractor shall not cause or permit any lien, attachment or other encumbrance by any person to be placed on file or to remain on file in any public office or on file with PMC against any money due or to become due for any work done or materials furnished under this Contract, or by reason of any other claim or demand against the Contractor.

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15. WARRANTY

Warranty on all goods supplied under the contract shall remain valid for 12 months from the date of supply of equipment or 18 months from the date of issue of order which ever is later.

The purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the Supplier shall, within the specified period repair or replace the defective goods or parts thereof, without costs to the purchaser.

16. ERECTION, TESTING, COMMISSIONING & PG TEST

- The Tenderer shall be fully responsible for the satisfactory erection / installation, testing and commissioning of all the equipment and material under his scope including pipe erection, insulation of pipes etc. The installation shall be carried out in line with the Central Pollution Control Board guidelines and Statutory Authority Rules and Indian Standards.
- The Tenderer shall provide all skilled, semi-skilled or unskilled labour, riggers, certified welders, pipe fitters. as well as erection and testing engineers.
- The electrical installation shall be carried out by an electrical contractor holding a valid license issued by the State government for carrying out the installation work of the voltage classes involved under the direct supervision of and by a person holding valid certificate of competency for the same voltage classes recognized by the state government.
- The work shall be executed in a professional workmanship manner.
- Nuts & bolts, gaskets, grease, lubricating oil, packing material, brass shims and other hardware necessary for erection work shall be included in Contractor's scope.
- All consumable items like, gases for welding, welding electrodes etc shall be provided by the Contractor at his cost.
- All tools, tackles, instruments, material handling equipment for transportation, mobile cranes, welding sets, gas cutting equipment, crimping tool, drill machines, level gauges etc shall be arranged by the Contractor for carrying out erection commissioning work.
- All tests shall be carried out at site by the Contractor using his own testing instruments having valid calibration certificates as well as qualified testing personnel.

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- Supply and erection of first aid boxes, fire extinguishers, sand buckets, shock treatment charts, rubber mats, danger boards etc. as per electricity rules and as per requirement for the premises of the plant shall be provided by the contractor.
- It is the total responsibility of the Contractor to ensure completeness of the job as per specification on turn key basis for supply, erection, testing & commissioning and handing over the plant to the full satisfaction of the Purchaser.

17. SPARES

The supplier shall carry sufficient inventories to assure ex stock supply of consumable spares for the goods supplied for a period of 2 years from the date of supply. The item of spare along with the quantity will be mutually agreed at time of finalization of contract. The supplier will forward all relevant drawings and documents to enable PMC to get these spare manufactured subsequently after the 2 years period are over.

18. CONSUMABLES

The contractor will include supply of consumables for running the plant (except the input material), if so desired in the tender enquiry the detailed item along with the cost will be finalized at the time of placement of order.

19. MANUALS / DRAWINGS

The supplier will submit 3 sets of manuals including drawings to enable smooth operation of plant and equipment covered under the supply.



20. INTELLECTUAL PROPERTY INFRINGEMENT

The Supplier warrants that the use or supply to PMC of the goods sold under this Purchase Order does not infringe any patent, design, trade-name or trade-mark. In addition, the Supplier shall, pursuant to this warranty, indemnify, defend and hold PMC harmless from any actions or claims brought against PMC pertaining to the alleged infringement of a patent, design, trade-name or trade-mark arising in connection with the goods sold under this Purchase Order.

21. RIGHTS OF PMC

In case of failure by the Supplier to fulfil its obligations under the terms and conditions of this Purchase Order, including but not limited to failure to obtain necessary export licences, or to make delivery of all or part of the goods by the agreed delivery date or dates, PMC may, after giving the Supplier reasonable notice to perform and without prejudice to any other rights or remedies, exercise one or more of the following rights:

- a) Procure all or part of the goods from other sources, in which event PMC may hold the Supplier responsible for any excess cost occasioned thereby.

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- b) Refuse to accept delivery of all or part of the goods.
- c) Cancel this Purchase Order without any liability for termination charges or any other liability of any kind to PMC.

22. TERMINATION

PMC, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the Supplier, may terminate this Contract in whole or in part:

- (a) If the Supplier fails to deliver any or all of the Goods within any extension thereof granted by the Purchaser.
- (b) If the supplier fails to perform any other obligation (s) under the Contracts



23. PACKING & MARKING :

- (a) All items shall be suitably packed for transit by rail / road.
- (b) Each package shall be suitably marked with identification markings to enable satisfactory reference to corresponding invoice and supply order. In addition the outer dimensions volume and gross weight of each package shall be stenciled legibly in metric units.
- (c) A packing note detailing the stores supply order no. and item no. is to be enclosed with each package showing order no. of total packing and contents of each package, etc. shall be made available to the consignee viz National Project Coordinator

24. SALES TAX

- (a) The prices indicated are inclusive of sales tax
- (b) The present rate of sales tax is _____%
- (c) While claiming sales tax please furnish the following certificates:
 “Certified that the goods on which sales tax has been charged have not been exempted under the Sales Tax Act or the rules made thereunder and the charge on account of sales tax on those goods are correct under the provision of that act or the rules made thereunder”
 “Certified further we (or our Branch) or Agent are registered as dealers in the State _____ (address) under Registration no. _____ for purpose of Sales Tax”

The stores should be on no account be dispatched / delivered without getting the same inspected and passed by the Inspecting Officer stipulated in the contracts. The contractor alongwith packing note of stores inform the consignee immediately after dispatch of store by rail / road.

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25. INSURANCE

- 25.1 The goods supplied under the contract shall be fully insured against loss or damage incidental to manufacture, transportation storage and delivery. The insurance shall be in an amount equal to 100% of the CIF value of the goods from warehouse to warehouse on all risk cover basis.
- 25.2 The purchaser will not separately have transit insurance and the supplier will be responsible until the entire stores contracted for arrive in good condition at destination. In case the contractor chooses to insure the goods he should notify the consignee in writing while forwarding the dispatch document (such as inspection notes etc.) about the time limit within which the claims for shortages in transit should be notified by the consignee. The insurance amount will be reimbursed by PMC.
- 25.3 The certificate of testing and guarantee of quality be also forwarded alongwith the material

26. ASSIGNMENT AND INSOLVENCY



- 26.1 The Supplier shall not, except after obtaining the written consent of PMC, assign, transfer, pledge or make other disposition of this Purchase Order, or any part thereof, or any of the Supplier's rights or obligations under this Purchase Order.
- 26.2 Should the Supplier become insolvent or should control of the Supplier change by virtue of insolvency, PMC may, without prejudice to any other rights or remedies, immediately terminate this Purchase Order by giving the Supplier written notice of termination.

27. COPYRIGHT, PATENTS AND OTHER PROPRIETARY RIGHTS

PMC shall be entitled to all intellectual property and other proprietary rights including but not limited to patents, copyrights, and trademarks, with regard to products, or documents and other materials which bear a direct relation to or are produced or prepared or collected in consequence of or in the course of the execution of this Contract. At the PMC's request, the Contractor shall take all necessary steps, execute all necessary documents and generally assist in securing such proprietary rights and transferring them to PMC in compliance with the requirements of the applicable law.

28. USE OF NAME, EMBLEM OR OFFICIAL SEAL OF UNDP OR THE UNITED NATIONS

The Contractor shall not advertise or otherwise make public the fact that it is a Contractor with PMC, nor shall the Contractor, in any manner whatsoever use the name, emblem or official seal of PMC or MOS, or any abbreviation of the name of PMC or the MOS in connection with its business or otherwise.

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29. CONFIDENTIAL NATURE OF DOCUMENTS AND INFORMATION



- 29.1 All maps, drawings, photographs, plans, reports, recommendations, estimates, documents and all other data compiled by or received by the Contractor under this Contract shall be the property of PMC, shall be treated as confidential and shall be delivered only to PMC authorized officials on completion of work under this Contract.
- 29.2 The Contractor may not communicate at any time to any other person, Government or authority external to PMC, any information known to it by reason of its association with PMC which has not been made public except with the authorization of PMC; nor shall the Contractor at any time use such information to private advantage. These obligations do not lapse upon termination of this Contract.

30. FORCE MAJEURE; OTHER CHANGES IN CONDITIONS

- 30.1 Force majeure, as used in this Article, means acts of God, war (whether declared or not), invasion, revolution, insurrection, or other acts of a similar nature or force which are beyond the control of the Parties.
- 30.2 In the event of and as soon as possible after the occurrence of any cause constituting force majeure, the Contractor shall give notice and full particulars in writing to PMC, of such occurrence or change if the Contractor is thereby rendered unable, wholly or in part, to perform its obligations and meet its responsibilities under this Contract. The Contractor shall also notify PMC of any other changes in conditions or the occurrence of any event which interferes or threatens to interfere with its performance of this Contract. The notice shall include steps proposed by the Contractor to be taken including any reasonable alternative means for performance that is not prevented by force majeure. On receipt of the notice required under this Article, PMC shall take such action as, in its sole discretion, it considers to be appropriate or necessary in the circumstances, including the granting to the Contractor of a reasonable extension of time in which to perform its obligations under this Contract.
- 30.3 If the Contractor is rendered permanently unable, wholly, or in part, by reason of force majeure to perform its obligations and meet its responsibilities under this Contract, PMC shall have the right to suspend or terminate this Contract on the same terms and conditions as are provided for in Article 15, "Termination", except that the period of notice shall be seven (7) days instead of thirty (30) days.

31. PROHIBITION ON ADVERTISING

The Supplier shall not advertise or otherwise make public that it is furnishing goods or services to Ministry of Steel or UNDP without specific permission from MOS or UNDP as the case may be.

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32. CHILD LABOUR

The Supplier represents and warrants that neither it nor any of its affiliates is engaged in any practice inconsistent with the rights set forth in the Convention on the Rights of the Child, including Article 32 of Constitution of India thereof, which, inter-alia, requires that a child shall be protected from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development.

Any breach of this representation and warranty shall entitle PMC to terminate this Purchase Order immediately upon notice to the Supplier, without any liability for termination charges or any other liability of any kind of PMC.

33. SETTLEMENT OF DISPUTES

33.1 Amicable Settlement

The Parties shall use their best efforts to settle amicably any dispute, controversy or claim arising out of, or relating to this Contract or the breach, termination or invalidity thereof. Where the parties wish to seek such an amicable settlement through conciliation, the conciliation shall take place in accordance with the procedure as may be agreed between the parties.


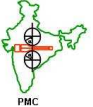
33.2 Arbitration

If at any time, any question, dispute or difference whatsoever shall arise between the purchaser / owner and the supplier upon or in relation to, or in connection with the contract (except as to any matter the decision on which is specifically provided for) the same may be referred to the sole arbitration of the Secretary, Ministry of Steel, Government of India or a person appointed by him. It will not be objected if the arbitrator is a Government servant that he had dealt with matters to which contract related or that in course of duties as a Government servant he has expressed views on all or any other matters in dispute or difference. The award of the arbitrator shall be final and binding on the parties to the contract.

Subject to as aforesaid the Arbitration and Conciliation Act 1996 of India and the rules thereunder and any other statutory modification thereof for the time being shall be deemed to apply to the arbitration proceedings under this clause. The Arbitrator shall have the power to extend with the consent of the purchaser and supplier, the time for making and publishing the award. The venue of arbitration shall be the place as the purchaser in his absolute discretion may determine.

34. PRIVILEGES AND IMMUNITIES

Nothing in or related to these General Terms and Conditions or this Purchase Order shall be deemed a waiver of any of the privileges and immunities of the United Nations, including its subsidiary organs.

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35. OBSERVANCE OF THE LAW

The Contractor / supplier shall comply with all laws, ordinances, rules, and regulations bearing upon the performance of its obligations under the terms of this Contract.

36. AUTHORITY TO MODIFY

No modification or change in this Contract, no waiver of any of its provisions or any additional contractual relationship of any kind with the Contractor shall be valid and enforceable against PMC unless provided by an amendment to this Contract signed by the authorized official of PMC.

37. JURISDICTION

All disputes will be subject to the territorial jurisdiction of Delhi including arbitration.