

**URANIUM CORPORATION OF INDIA LIMITED**  
**P.O. JADUGUDA MINES, JHARKHAND – 832102, INDIA**

**TENDER DOCUMENT – INDEX SHEET**

REF: TENDER NO. PUR / 2 / 19 / 9119 / 593  
ITEM: MAGNETITE MILLING SYSTEM COMPLETE

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URANIUM CORPORATION OF INDIA LIMITED  
P.O. JADUGUDA MINES, JHARKHAND – 832102

TENDER OPENING SCHEDULE

REF: TENDER NO	PUR / 2 / 19 / 9119 / 593
TENDER DATE	30.10.2013
ITEM	MAGNETITE MILLING SYSTEM COMPLETE
SUBMISSION OF TENDER	ON OR BEFORE 16.12.2013 BY 10.00 A.M
TENDER OPENING ON	16.12.2013
AT	10.30 AM
VENUE	PURCHASE DEPARTMENT, UCIL, JADUGUDA

## Annexure 1(A)

### Scope of Work:

#### A) Design & Engineering :

Design criteria:

**Mill size should be 7' in diameter and 15' in length.**

- Design and drawing of the complete Magnetite ball mill that includes process, mechanical, electrical and instrumentation for the grinding circuit comprising of Mill, hydrocyclone, sump, hydrocyclone feed pumps, sump pumps, tundish/ trough necessary piping etc.
- Design and drawing of civil foundations of all equipments, including bar bending schedule, supplied by the bidder.
- Design & drawing of all structural platforms for hydrocyclone, running pipes, launders, troughs, and critical instruments.
- Design and drawing of H.T switch gear, grid resistant starter, APFC Panel, M.C.C. as per list of feeders and all instrumentation system given by the purchaser and other required.
- Layout fitting to the existing set up will be in the bidder's scope.
- Addressing all clarifications raised by AERB regarding design basis of Civil foundations for mill.

#### B) Supply of Equipments

The scope of work under this head is to supply, all process/mechanical and electrical equipments comprising of Grinding mill, motor and switch gear, hydrocyclone, mill discharge sump pit, M.C.C. (As per list of the feeders given in annexure -1), hydrocyclone feed pump, power cables, control cables, cable glands (Double compression glands), cable sockets cable tray –ladder type (fabricated with GI angles), and other accessories for laying, dressing and termination of cables, interfacing with new & existing equipments. All piping, bends & valves required for the system are also in bidder's scope of supply.

All electrical equipments should be properly earthed through G.I strips of proper size. The supplies of G.I. strips are also in the scope of supply. Any equipment or items not mentioned specifically but required for, to complete the system must be mentioned in the scope of supply of equipments and also included in the scope of supply. Making of earth pits at different locations shall also be in the scope of bidder including interconnections of earth strips with earthing of various equipments

In addition to the initial charge, grinding media (High chrome steel ball, minimum average hardness 600BHN) for addition 3 (three) month's consumption will also be in the bidder's scope of supply.

C) Erection and commissioning of Magnetite ball mill:

1. The scope of work under this head includes erection and commissioning of all process/mechanical, electrical and instruments supplied by the bidder under this package.
2. Laying of cables and cable trays and other accessories. the above mentioned jobs are to be done in three phases and will have to be complete within 30 days
  - I. Installation of all equipments.
  - II. Laying of power, control cables and connecting to individual equipments.
  - III. Trial run/ No load test/ Full Load test / commissioning & performance demonstration.

D) Performance testing of Magnetite Ball mill:

The scope of work under this head includes the demonstration of performance guarantee data as specified in the performance guarantee clause.

E) Exclusion:

- All civil and structural works at site for installation of equipments
- Plant illumination and lighting
- Plant drainage system.
- Dismantling of equipments, structure etc.

PACKAGE NO. MBM-01

# Magnetite Ball Mill

SECTION - II

TECHNICAL SPECIFICATION

**SECTION - II**  
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## **GENERAL CONDITIONS**

### **1. APPLICATION**

Unless otherwise provided in the Contract, these General Conditions shall govern the Contract.

### **DEFINITIONS AND INTERPRETATION**

#### **2.1 Definition of Terms**

In construing the Contract, the following words shall have the meanings herein assigned to them unless there is something in the subject or context inconsistent with such construction:

- a) The 'Owner' / 'Purchaser' / 'Client' / 'Company' / 'Corporation' / 'Employer' shall mean "Uranium Corporation of India Limited" having its Registered and Head Offices at Jaduguda, P.O. Jaduguda Mines, Singhbhum (East), Jharkhand-832102, referred to throughout in the Contract Document by 'Owner' or 'Purchaser' or 'Client' or UCIL or 'Company' or 'Corporation'.
- b) The 'Contractor' is the successful Tenderer who is awarded the Contract by the Owner to perform the Works covered by the Contract and shall be deemed to include the Contractor's, successors, heirs, executors, administrators, representatives or assigns approved by the Purchaser and will be referred to as if of masculine gender and singular number, throughout in these Documents.
- c) The term 'Sub-Contractor' used herein refers to a party or parties having a direct contract with the Contractor to whom any part of the Contract has been sublet by the Contractor with the consent in writing of the Owner.
- d) 'Accepting Authority' shall mean the Chairman and Managing Director of UCIL or his representative appointed by him in writing to act on his behalf.
- e) The 'Engineer'/'Engineer-in Charge' shall mean the officer(s) appointed in writing by the Accepting Authority to act as 'Engineer'/'Engineer-in Charge' from time to time for the particular contract.
- f) The 'Engineer's Representative' shall be the person nominated by the Engineer in writing to act on his behalf.

- g) 'Plant', and/or 'Equipment', and/ or 'Component' shall mean and include plant, stores and materials to be provided and work to be done by the Contractor under the Contract.
- h) 'Works' means the works to be executed by the Contractor in accordance with the Contract, which has also been referred to as 'Contract Work'.
- i) 'Temporary' works means all Temporary works of every kind required in or about the execution completion and maintenance of the works by the Contractor at their own cost and risk.
- j) 'Constructional Plant', 'Contractors Equipment' shall mean all appliances or things of whatsoever nature required in or about the execution, completion and maintenance of the Works or Temporary Works by the Contractor at his own cost and risk (as hereinafter defined) but does not include materials or other things intended to form or forming part of the permanent work.
- k) 'Contract' means the Notice Inviting Tenders, Conditions of Tendering, Tender Form, General Conditions of Contract, General Specification, Technical Specifications, Priced Schedule of Items, the Letter of Acceptance, Contract Agreement and Drawings and any other document which may be included at the time of signing of the Contract Agreement. Till formal contract Agreement is executed the Letter of Intent / Letter of Acceptance shall be deemed to be the Contract.
- l) The 'Specification' shall mean the Specification annexed to these General Conditions and any subsequent modifications thereof and the drawings and Schedule attached thereto (if any) and such other specifications as may be approved by the Engineer.
- m) 'Drawings' means the Drawings referred to in the Contract and any modification of such drawings approved in writing by the Engineer and such other Drawings as may from time to time be furnished or approved in writing by the Engineer.
- n) 'Site' means the lands and other places on,. under, in or through which the works are to be executed or carried out and any other lands or places provided by the Owner for the Purpose of the Contract.
- o) 'Defects Liability Period' shall mean the period of guarantee as explained under Clause 37.1 of these General Conditions.

- p) 'Month' shall mean calendar month, 'Day' shall mean a period of 24 hours beginning at midnight.
- q) "Letter of Intent"/"Letter of Acceptance" shall mean the Purchaser's letter conveying his acceptance of the Tender subject to such reservations as may have been stated therein.
- r) 'Approved' or 'to approval' shall mean as approved by or approval of the Consulting Engineer or Owner or Engineer.
- s)
  - i) 'F.O.B.' shall mean delivery free of expenses to the Purchaser on board the vessel at the port of shipment.
  - ii) 'F.O.R. Destination' shall mean delivery free of expenses to the Purchaser on rail wagons at destination Railway Station siding as may be named or in the case of despatched by road free on road carrier delivered at site.
  - iii) The phrase 'F.O.R. Works' shall mean loaded and stored or trimmed, free of expenses to the Purchaser on road carrier or on board rail-wagons at Contractor's siding or at the nearest Railway Station for transportation.
  - iv) 'C.I.F.' Port' shall mean Cost Insurance and Freight inclusive delivery free of expenses to the Purchaser at Indian Port of entry.
  - v) C.I.F. site shall mean Cost Insurance and Freight inclusive delivery free of expenses to the Purchaser at site.
- t) The 'Contract Sum' shall mean:
  - i) In the case of Lump Sum Contract the sum for which the tender is acceptable.
  - ii) In the case of percentage Rate Contracts the estimated value of the works as mentioned in the tender adjusted by the Contractor's percentage.
  - iii) In the case of Item Rate Contracts the cost of the work arrived at after multiplying of the quantities shown in Schedule of Quantities by the item rates quoted by the Tenderer or as finally accepted for the various items, subject to any variation mentioned in the Contract.

- u)
  - i) Market Rate shall be rate as decided by the Engineer on the basis of the cost of materials and labour at the site where the work is to be executed, plus the percentage mentioned in relevant schedule to cover all overheads and profit.
  - ii) "Schedule(s)" referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers issued by the Purchaser or the standard schedule of rates prescribed by the Purchaser and the amendments thereto issued from time to time.
  - iii) 'Urgent Works' shall mean any urgent measures that, in the opinion of the Engineer, become necessary during the progress of works to obviate any risk of accident or failure of which become necessary for security.
- v)
  - i) 'Initial Operation' or 'Reliability Run' shall mean continuous operation of the contract plant and materials under varying load to furnish proof of satisfactory operation for a specified period which shall not be less than four (4) weeks.
  - ii) 'Commissioning' shall mean the successful operation of the plant and equipment after all initial adjustments, trials, cleaning and reassembly required at site, if any, have been completed.
  - iii) 'Tests on Completion' shall mean such tests as are prescribed by the Specification and/or tests mutually agreed upon by the Purchaser and the Contractor to be made by the Contractor after erection of the equipment to prove satisfactory operation as required by the Specification.
  - iv) 'Acceptance Tests' shall mean such tests, as are required to prove the performance guarantees of the plant given by the Contractor before taking over of the plant by the Purchaser.
- w) 'Warranty Period' shall mean the period of guarantee and shall have the same meaning as Defect Liability Period defined in Clause 37.1 of these General Conditions.
- x) 'Security Deposit' or 'Security Bond' shall have the same meaning as Performance Bond as indicated in Clause 11.1 of these General Conditions.

## 2.2 Interpretation

Words importing persons or parties shall include firms and corporations.



### **2.3 Singular and Plural**

Words importing the singular only also include the plural and vice versa where the context requires.

### **2.4 Headings or Notes**

The Headings and marginal notes in these General Conditions shall not be deemed part thereof or be taken into consideration in the interpretation or construction thereof or of the Contract.

### **2.5 Cost**

The word 'Cost' shall be deemed to include overhead costs whether incurred on or off the site

## **3.0 LANGUAGE AND SYSTEMS OF MEASUREMENT**

### **3.1 Language**

English shall be the ruling language. Any tender, drawing, technical data, document and/or correspondence which forms the basis of an order or contract or which may be furnished by the Contractor for the Purchaser's approval or information as provided under the said order or contract, shall be in English.

### **3.2 Systems of Measurement**

The metric system of measurements shall be used in all specifications, drawings, designs, documents and/or correspondences. All measuring devices, instruments and appliances shall be designed for working on the metric system.

## **4.0 ENGINEER AND ENGINEER'S REPRESENTATIVE**

### **4.1 Engineer's Duties**

The Engineer shall carry out such duties in issuing decisions, certificates and orders as are specified in the Contract.

### **4.2 Engineer's Representative**

The Engineer's Representative shall be responsible to the Engineer and his duties are to watch and supervise the works and to test and examine any plant, equipment, component, materials or workmanship employed in connection with the Works. The Engineer's Representative shall have no authority to relieve the Contractor of any of his obligations under the Contract nor except as expressly provided in the Contract, to order any work involving delay in completion or any extra payment to the Contractor by the Purchaser nor to make any variation to the works.

#### **4.3 Engineer's Power to Delegate**

The Engineer may from time to time in writing delegate to the Engineer's Representative any of the powers, discretion, functions and/or authorities vested in him and he may at any time revoke any such delegation. The Engineer shall furnish to the Contractor a copy of any such written delegation or revocation. No such delegation or revocation shall have effect until a copy thereof has been delivered to the Contractor. Any written decision, instruction or approval given by the Engineer's Representative to the Contractor in accordance with such delegation shall bind the Contractor and the Purchaser as though it had been given by the Engineer provided always that :

- (a) Any failure of the Engineer's Representative to disapprove any Plant, equipment, component, material or workmanship shall not prejudice the power of the Engineer thereafter to disapprove such plants material or workmanship and to order the rectification thereof in accordance with these Conditions.
- (b) If the Contractor shall be dissatisfied by reason of any decision of the Engineers Representative he shall be entitled to refer the matter to the Engineer who will thereupon confirm, reverse or vary such decision in accordance with Clause 14 (Engineer's Decisions).

#### **4.4 Engineer to Act Fairly**

Wherever by these Conditions the Engineer is required to exercise his discretion, by the giving of a decision, opinion, consent or to express satisfaction or approval or to determine value or otherwise take action which may affect the rights and obligations of either the Purchaser or the Contractor, the Engineer shall exercise such discretion fairly within the terms of the Contract and having regard to all the circumstances.

#### **5.0 ASSIGNMENT AND SUB-LETTING**

##### **5.1 Assignment**

The Contractor shall not assign the Contract or any part thereof or any benefit, obligation or interest therein or thereunder without the prior written consent of the Purchaser.

##### **5.2 Sub-Letting**

The Contractor shall not sub-let the whole of the works. Except where otherwise provided by the Contract, the Contractor shall not sub-let any part of the works without the prior written consent of the Engineer. Any such consent, if given, shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any Sub-Contractor, his agents, servants or

workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen. Provided that the restriction contained in this Clause shall not apply to Sub-Contracts for any part of the works of which the makers are named in the Contract.

## **CONTRACT DOCUMENTS**

### **6.1 Documents Mutually Explanatory**

Unless otherwise provided in the Contract, the provisions of General Conditions shall prevail over those of any other document forming part of the Contract and in case of conflict Special Conditions shall prevail over General Conditions. Subject to the foregoing the several documents forming the Contract are to be taken as mutually explanatory of one another but in the case of ambiguities or discrepancies the same shall be explained and adjusted by the Accepting Authority who shall thereupon issue to the Contractor instructions thereon. Provided always that if in the opinion of the Accepting Authority compliance with any such instructions shall involve the Contractor in any cost which, by reason of such ambiguity or discrepancy the Contractor did not and had reason not to anticipate, the Accepting Authority shall certify and the Purchaser shall pay such additional sum as may be reasonable to cover such cost.

### **6.2 Secrecy**

The Contractor shall take necessary steps to ensure that all persons employed on any work in connection with contract have noticed that the Indian Official Secret Act 1923 (XIX of 1923) and Indian Atomic Energy Act 1962 (XXXIII of 1962) and latest amendment applied to them and shall continue so to apply even after the execution of such works under the Contract.

### **6.3 Governing Laws and Jurisdiction**

This Contract shall be governed by the Indian Laws in force and it shall be deemed to have been executed at Jaduguda, District Singhbhum (East), Jaduguda, India within the ordinary civil jurisdiction of the competent court situated in Ghatsila, District Singhbhum (East), Jharkhand.

### **7.1 Drawings**

The Contractor shall submit to the Engineer for approval.

- (a) Within the times given in the Specification or in the program to be provided under Clause 15 as given in the technical specifications, such drawings, samples, patterns and models as may be called for therein and in the numbers therein required.
- (b) During the progress of the works within such reasonable time as the Engineer may require such drawings of the general arrangement and details of the works as the Engineer may reasonably require.

Within the times given in the Specification or the program, after receiving such drawings, samples, patterns and models, the Engineer and/ or Consultant shall signify his approval or otherwise. The Contractor shall supply additional copies of approved drawings in accordance with the details set out in the Specification .

If the Engineer and/ or Consultant shall not approve any Drawing, sample, pattern or model so provided, the same shall be forthwith modified to meet the reasonable requirements of the Engineer and/ or Consultant and shall be resubmitted. Approved Drawings shall be signed or otherwise certified by the Engineer and / or Consultant. Drawings shall be supplied as specified.

## **7.2 Approved Drawings**

Drawings approved as above described shall not be departed from except as provided in Clause 38 (Variations). Approval of drawing does not relieve the responsibility of the Contractor to achieve the Performance Guarantee.

## **7.3 Inspection of Drawings**

The Engineer shall have the right at all reasonable times to inspect at the premises of the Contractor all Drawings of any portion of the works.

## **7.4 Foundation Drawings**

The Contractor shall within the times mentioned in the Specifications or in accordance with the program, provide drawings showing the manner in which the Plant is to be affixed together with all information relating to the works required for preparing suitable foundations for providing suitable access for the Plant and any necessary equipment to the point on Site where the plant is to be erected and for making all necessary connections to the Plant (whether such connections or foundation drawings are to be made by the Contractor under the Contract or not).

## **7.5 Errors in Drawings**

Subject to Clause 8.1 (Mistakes in information) any expenses resulting from an error or omission in or from delay in delivery of the drawings and information mentioned in Sub-Clause 4 of this Clause shall be borne by the Contractor.

## **7.6 Operating and Maintenance Instructions**

The Contractor shall furnish to the Purchaser before the works are taken over, Operating and Maintenance Instructions of all equipment / systems together with Drawings of the Works as completed in sufficient detail to enable the Purchaser to maintain, dismantle, reassemble and adjust all parts of the works. Unless otherwise agreed, the works shall not be considered to

be completed for the purposes of taking over under the terms of Clause 36 (Taking Over) until such instructions and drawings have been supplied to the Purchaser.

**8.1 Mistakes in Information**

The Contractor shall be responsible for any discrepancies, errors or omissions in the Drawings and information supplied by him whether they have been approved by the Engineer or not provided that such discrepancies, errors or omissions are not due to incorrect drawings or inaccurate information furnished to the Contractor in writing by the Purchaser or the Engineer.

**8.2 Errors by Contractor**

The Contractor shall at his own expense carry out any alternations or remedial work necessitated by reason of such discrepancies, errors or omission for which he is responsible and modify the drawings and information accordingly and shall bear all costs incurred therein. The performance of his obligations under this Sub-Clause shall be in full satisfaction of the Contractor's liability under Sub-Clause 1 of this Clause and under Clause 7.5 but shall not relieve him of his liability under Clause 35.2 (Delay in Completion) in so far as that liability arises as a result of such discrepancies, errors or omission.

**OBLIGATIONS OF THE CONTRACTOR**

**9.1 General Obligations**

The Contractor shall subject to the provisions of the Contract, execute the works with the due care and diligence within the Time for Completion and shall provide all labour, including the supervision thereof and Contractor's Equipment, necessary thereof and all other things whether temporary or permanent nature and for carrying out his obligations under Clause 37 (Defects), so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

**9.2 Setting Out**

The Contractor shall be responsible for the accurate setting out of the Works in relation to original points, lines and levels of reference given by the Engineer in writing and for the correctness, subject as above mentioned, of the positions, levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labour in connection therewith. If, at any time during the progress of the Works, any error shall appear or arise in the positions, levels, dimensions or alignment of any part of the works, the Contractor, on being required so to do by the Engineer or the Engineer's Representative, shall at his own cost, rectify such error to the satisfaction of the Engineer or the Engineer's Representative, unless such error is based on incorrect data supplied in writing by the

Engineer or the Engineer's Representative or as a result of default by another contractor, not being a Sub-Contractor, in which case the cost of rectifying the same shall be borne by the Purchaser. The checking of any setting out or of any line or level by the Engineer or the Engineer's Representative shall not in any way relieve the Contractor of his responsibility for the accuracy thereof. The Contractor shall carefully protect and preserve bench marks, sight rails, pegs and other things used in setting out the works.

#### **10.0 Contract Agreement**

The Contractor shall enter into and execute a Contract Agreement (to be prepared and completed by the Contractor) in the form annexed with such modification as may be necessary within 30 days from the issue of Letter of Acceptance. Till the formal contract Agreement is executed the Letter of Acceptance will have the force of Contract Agreement. The Letter of Acceptance and also the Contract Agreement shall be signed on behalf of the Purchaser by the Accepting Authority or his nominee. The Contract Agreement shall be signed on behalf of the Contractor by person(s) holding Power of Attorney on behalf of the Contractor. The Successful Contractor will prepare the bond copies of Contract Agreement at his own cost and after signing of his document will submit 10 (Ten) copies of the same to the purchaser at free of cost.

#### **11.1 Performance Bond**

For the performance of the contract the contractor shall furnish a Bank Guarantee of a reputed Scheduled Commercial bank approved by the purchaser in favour of the purchaser, within 14 days from the issuance of letter of intent/acceptance. The amount of such Bank Guarantee shall be equivalent to 10% of the contract sum. The terms and conditions of the Bank Guarantee shall have to be in accordance with the specimen annexed to the tender document and confirmed by the contractor in its techno commercial offer. The cost of the Bank Guarantee shall have to be borne by the contractor. The Bank Guarantee shall remain valid till expiry of the defect liability period in terms of clause 37.1 herein and issue of final certificate by the engineer.

#### **12.1 Contractor to Inform Himself Fully**

The Contractor shall be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself fully, before submitting his Tender, as to the form and nature thereof, including the sub-surface conditions, the hydrological and climatic conditions, the extent and nature of work and materials necessary for the completion of the works, the means of access to the Site and the accommodation he may require and, in general shall be deemed to have

obtained all necessary information as to risks, contingencies and all other circumstances which may influence or affect his Tender.

If he shall have any doubt as to the meaning of any portion of the Tender documents, he shall set forth the particulars thereof and submit them to the Purchaser in writing for clarification. Any information thus had or otherwise obtained from the Purchaser shall not in any way relieve the Contractor from his responsibility for supplying the plant and equipment and or executing the works in terms of the specification, including all detailed and incidental work and supply of all accessories, apparatus or materials which may not have been specifically mentioned in the Specification or drawings, but otherwise necessary for insuring complete erection and safe and efficient commercial working of the plant and equipment and / or complete execution of the works.

#### **12.2 Sufficiency of Tender**

The Contractor by tendering shall be deemed to have satisfied himself as to all the conditions and circumstances affecting the Contract Sum, as to the possibility of executing the works as shown and described in the Contract, as to the general circumstances at the site of the works, if access thereto has been made available to him and as to the general labour position at the site and to have determined his prices accordingly. The Contractor shall be responsible for any misunderstanding or incorrect information however obtained except information given in writing by the Purchaser or the Engineer.

#### **12.3 Import License and Foreign Exchange**

Unless otherwise provided in the Contract, the Contractor shall obtain all import permits or licenses and arrange all foreign exchange required for any part of the Plant or Works.

#### **12.4 Consents, Way leaves etc.**

The Contractor shall, before the time specified for delivery of any Plant, equipment, component or material to the Site, obtain all consents, way leaves and approvals required in connection with the Regulations and By-laws of local or other authority which shall be applicable to the works.

#### **13.1 Contractor's Key Personnel**

The Contractor shall furnish the list of Key Personnel, along with details of their experience, proposed to be engaged in the execution of the Contract for approval by the Engineer. Only the persons approved by the Engineer shall be deployed in the execution of the Contract. Such approval by the Engineer shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

#### **13.2 Training**

The Contractor shall during the currency of the Contract when called upon by the Engineer engage and also ensure engagement by sub-contractors and others employed by the Contractor in connection with the works, such number of apprentices as required under the Apprentices Act. 1961 and shall be responsible for all obligations of the Purchaser under the Act including the liability to make payment to Apprentices as required under the Act.

The Contractor shall also be responsible for any other specific training requirement as per the provisions set out in the specification.

#### **14.0 Engineer's Decisions**

The Contractor shall proceed with the works in accordance with the decisions instructions and orders given by the Engineer in accordance with these Conditions, provided always that:

- (a) If the Contractor shall, without undue delay after being given any decision, instruction or order otherwise than in writing, require it to be confirmed in writing, such decision, instruction or order shall not be effective until written confirmation thereof has been received by the Contractor, and
- (b) If the Contractor shall, by written notice to the Engineer within fourteen (14) days after receiving any decision, instruction or order of the Engineer in writing or written confirmation thereof, dispute or question the decision, instruction or order, giving his reasons for so doing, the matter shall be referred to the Engineer who shall within a further period of twenty one (21) days by notice in writing, with reasons therefore, to the Contractor confirm, reverse or vary such decision.

#### **15.0 PROGRAM**

##### **15.1 Program to be furnished**

The Contractor shall submit with his Tender, a program in the form of Network in MS Projects or Primavera, according to which he proposes to carry out the works.

Within the time stated in Special Conditions, or if no time is stated within one month of the acceptance of his Tender the Contractor shall submit to the Engineer for his approval a program based on above showing, in such form as may reasonably be required by the Engineer, the order of procedure in which he proposes to carry out the works on site and commissioning thereof. The submission to and approval by the Engineer of such program shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

##### **15.2 Procedure and Method**

After submission to and approval by the Engineer of such program the Contractor shall adhere to the order of procedure and method stated therein



unless he obtains the written permission of the Engineer to vary such order or method.

### **15.3 Progress of Works**

The Contractor shall submit Monthly Reports identifying quantitatively the monthly as well as cumulative progress of work against targets in such form as may reasonably be required by the Engineer. If at any time it should appear to the Engineer that the actual progress of the Works does not conform to the Program, the Contractor shall produce, at the written request of the Engineer, a revised program showing the modifications to the approved program necessary to ensure completion of the works within the Time for completion.

Besides this report, regular weekly /monthly meeting are to be conducted with the Contractor as per direction of the Engineer-in-Charge. The documentary evidence in support of the monthly report are required to be produced, as and when asked for.

## **CONTRACTOR'S SUPERINTENDENCE**

### **16.1 Contractor's Representatives**

The Contractor shall employ one or more competent representatives, whose name or names shall have previously been communicated in writing to the Engineer by the Contractor, to superintend the carrying out of the Works on the Site. The said representative, or if more than one shall be employed, then one of such representatives, shall be present on the Site during all working hours and any orders or instructions which the Engineer may give to the said representative of the Contractor shall be deemed to have been given to the Contractor.

### **16.2 Notice of Objection**

The Engineer shall be at liberty by notice in writing to the Contractor to object to any representative or person employed by the Contractor in the execution of or otherwise about the works who shall in the opinion of the Engineer, misconduct himself or be incompetent or negligent. The Contractor shall replace such person from the Works immediately.

### **17.1 Contractor's Equipment**

Except to the extent specified in Special Conditions the Contractor shall at his own expense, provide all Contractor's Equipment, haulage and water and power necessary to execute and complete the works.

### **17.2 Fencing, Lighting, Guarding and Fire Protection**

The Contractor shall be responsible for the proper fencing, lighting, guarding and watching of all the Works under this Contract on the site at his own expense until taken over and for the proper provision during a like period of

temporary roadways, footways, guards and fences as far as the same may be rendered necessary by reason of the works for the accommodation and protection of the owners and occupiers of adjacent property, the public and others. No naked light shall be used by the Contractor on the site otherwise than in the open air without specific permission in writing from the Engineer.

The Contractor shall also take all reasonable precautions to prevent fires of any nature in the general area and vicinity of his operation and he shall be responsible for all damages from fires attributable to his own activities or to those of his employees or to the activities of his Sub-Contractors or their employees.

**17.3 Electricity, Water and Space**

The Contractor shall be entitled to use for the purposes of the works such supplies of electricity and water and also space as may be available therefore on the Site and of which details are given in Special Conditions and shall at his own expense, provide any equipment and distribution line necessary for such use and shall pay to the Purchaser for such use such sum as may reasonably be fixed by the Engineer.

**17.4 Opportunities for other Contractors**

The Contractor shall in accordance with the requirements of the Engineer, afford all reasonable opportunities for carrying out their work to any other contractors employed by the Purchaser and their workmen and the workmen of the Purchaser and of any other duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any Contract which the Purchaser may enter into in connection with or ancillary to the Works. If, however, the Contractor shall on the written request of the Engineer or the Engineer's Representative, make available to any such other Contractor, or to the Purchaser or any such authority, any Contractor's Equipment or provide any other service of whatsoever nature the Purchaser shall pay to the Contractor in respect of such use or service such sum or sums as shall in the opinion of the Engineer, be reasonable.

**17.5 Protection Trees**

Trees designated by the Engineer shall be protected from damages during the course of the works and earth level within 1 meter of each such tree shall not be changed. Where necessary, such trees shall be protected by providing temporary fencing.

**17.6 Fossils etc.**

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site of the works shall as between the Purchaser and the Contractor be deemed to be the absolute property of the Purchaser. The Contractor shall take responsible precautions to prevent his workmen or any other persons

from removing or damaging any such article or thing and shall immediately upon discovery thereof and, before removal, acquaint the Engineer's Representative of such discovery and carry out, at the expense of the Purchaser, the Engineer's Representative's orders as to the disposal of the same.

## **LIABILITY FOR ACCIDENTS AND DAMAGE**

### **18.1 Care of the Works**

The Contractor shall take full responsibility for the care of the works or any Section or Portions thereof until the date stated in the Taking-over Certificate issued in respect thereof under Clause 36 (Taking Over) and in case any damage or loss shall happen to any Portion of the works not taken over as aforesaid, from any cause whatsoever (save and except the damages to works at site caused by the excepted risks as defined in Sub-Clause 2 of this Clause) the same shall be made good by and at the sole cost of the Contractor and to the satisfaction of the Engineer. The Contractor shall also be liable for any loss of or damage to the works occasioned by him or by any Sub-Contractor in the course of any operations carried out by him or by his Sub-Contractors for the purpose of completing any outstanding work or complying with his obligations under Clause 37 (Defects).

### **18.2 Damage to persons and property before taking over**

The Contractor shall indemnify the Purchaser in respect of death or injury to any person and of all damages to any property (other than property forming part of the works not yet taken over) occurring before all the works shall have been taken over and against all actions, suits, claims, demands, costs, charges and expenses arising in connection therewith that shall be occasioned by the negligence of the Contractor or any Sub-Contractor or by defective design (other than a design made, furnished or specified by the Purchaser and for which the Contractor has disclaimed responsibility giving appropriate reasons in writing within a reasonable time after the receipt of the Purchaser's instructions), materials or workmanship but not otherwise. Provided that the Contractor shall not be liable by virtue of this Sub-Clause in respect of damage or injury attributable to defects in any Section or Portion of the Works taken over.

### **18.3 Damage to persons and property after taking over**

If there shall occur any loss of or damage or injury to any property (other than property forming part of the works not yet taken over) or person while the Contractor is on the Site for the purpose of making good a defect in any Section or Portion of the Works pursuant to Clause 37 (Defects) or for the purpose of carrying out Tests on Completion of any such section during the Defects Liability Period as provided in Sub-clause 36.4 (Interference with Tests) the Contractor shall be liable as follows :

(a) In respect of loss of or damage to the said Section or portion the Contractor's obligation shall be as defined in Clause 37 (Defects).

(b) In respect of damage or injury to any other property or to any person and of any actions, claims, demands, costs, charges and expenses arising in connection therewith the Contractor shall be liable to the extent that such damage or injury was caused by the negligence of the Contractor or a Sub-Contractor while on the site as aforesaid or by defective materials or workmanship used in making good the said defect but not otherwise.

The said section or portion of the works shall be defined by reference to the Taking Over Certificate issued in respect thereof pursuant to Clause 36 (Taking over).

#### **18.4 Damage to Persons and Property from a Cause Occurring before taking over**

If there shall occur, after the commencement of the Defects Liability Period in respect of any Section or Portion of the Works, any loss of or damage or injury to any property (other than property forming part of the Works not yet taken over) or person as a result of a cause occurring prior to the commencement of the Defects Liability Period the Contractor's Liability shall be as follows :

(a) In respect of loss of or damage to the said Section or Portion the Contractor's obligations shall be as defined in Clause 37 (Defects).

(b) In respect ;of damage or injury to any property or to any person and of any actions, claims, demands, costs, charges and expenses arising in connection therewith the Contractor shall be liable to the extent that such damage or injury was caused by the negligence of the Contractor or a Sub-Contractor or by defective design (other than a design made, furnished or specified by the Purchaser and for which the Contractor has disclaimed responsibility giving appropriate reasons in writing within a reasonable time after receipt of the Purchaser's instructions) materials or workmanship but not otherwise.

#### **18.5 Claims for damage to persons or Property**

In the event of any claim being made against the Purchaser arising out of the matters referred to in and in respect of which the Contractor may be liable under this Clause, the Contractor shall be promptly notified thereof and may at his own expense conduct all negotiations for the settlement of the same and any litigation that may arise therefrom. The Purchaser shall not, unless and until the Contractor shall have failed to take over the conduct of the negotiations or litigation, make any admission, which might be prejudicial thereto. The conduct by the Contractor of such negotiations or litigation shall be conditional upon the Contractor having first given to the Purchaser such reasonable security as shall from time to time be required by the Purchaser to cover the amount ascertained or agreed or estimated, as the case may be

of any compensation damages, expenses and costs for which the Purchaser may become liable. The Purchaser shall at the request of the Contractor, afford all available assistance for any such purpose and shall be repaid all reasonable costs incurred in so doing.

**18.6 Accident or Injury to Workmen**

The Contractor shall indemnify the Purchaser against all actions, suits, claims, demands, costs or expenses arising in connection with death or injuries (other than such as may be the responsibility of the Purchaser, his agents or servants) suffered by persons employed by the Contractor or his Sub-Contractors on the Works, whether at Law or order any Statutes dealing with the question of the liability of employers for injuries suffered by employees.

**19.0 Indirect or Consequential Damage**

Except as provided in Clause 35.1 (Delay in Completion) for a reduction of the Contract sum for delay and except as provided in Clause 37.11 (Gross Misconduct) the Contractor shall not be liable to the Purchaser by way of indemnity or by reason of any breach of the Contract for loss of use (whether complete or partial) of the Works or of profit or of any contract or for any indirect or consequential damage that may be suffered by the Purchaser.

**INSURANCE, REGULATIONS AND PATENT RIGHTS**

**20.1 Insurance of Works (equipment or any other material at site)**

The Contractor shall in the joint names of the Contractor and the Purchaser, insure the all works and keep each part hereof insured for the Contract Sum against all loss or damage from whatever cause arising other than the excepted risks, from the date of shipment or the date on which it becomes the property of the Purchaser, whichever is the earlier, until it is taken over by the Purchaser. The Contractor shall insure against the Contractor's liability in respect of any loss or damage occurring whilst the Contractor is on Site for the purpose of making good a defect or carrying out the Tests on completion during the Defects Liability period or for the purpose of completing any outstanding work and against any loss or damage arising during the Defects Liability period from a cause occurring prior to taking over. Such insurance shall be effected with an insurer for a sum and in terms to be approved by the Purchaser and the Contractor shall from time to time, when so required by the Engineer, produce the policy and receipts for the premium or premiums or satisfactory evidence of insurance cover. All moneys received under any such policy shall be applied in or towards the

replacement and repair of the Works lost, damaged or destroyed by this provision shall not affect the Contractor's liabilities under the Contract. The Contractor shall ensure also the insurance of whole works against theft, fire, damage etc. till taking over by the Purchaser

#### **20.2 Third Party Insurance**

The Contractor shall, prior to the commencement of any work on the Site by the Contractor pursuant to the Contract, insure against his liability for damage or injury occurring till the Defects liability period is over to any person (including any employee of the Purchaser or other contractors) or to any property (other than property forming part of the Works) due to or arising out of the execution of the Works. Such insurance shall be effected for an amount with an insurer and in terms to be approved by the Purchaser and the Contractor shall from time to time when so required by the Engineer produce the policy and the receipts for the premiums or satisfactory evidence of insurance cover. The terms of the policy shall include a provision whereby, in the event of any claim being made against the Purchaser in respect of which the Contractor would be entitled to indemnity under the policy, the insurer will indemnify the Purchaser against such claims and any costs, charges and expenses in respect thereof.

#### **20.3 Insurance Against Accident etc. to Supervisory Staff**

The Contractor shall insure and shall maintain insurance against his liability under Clause 18.7 (Accident or injury to Workmen) and shall from time to time when so required by the Engineer produce the policy and the receipts for the premiums or satisfactory evidence of insurance cover. The terms of any such policy shall also include the provision to indemnify the Purchaser mentioned in Sub-Clause 2 of this Clause. Provided always that in respect of any persons employed by any Sub-Contractor's obligation under this Sub-Clause shall be satisfied if the Sub-Contractor shall have insured against the liability in respect of such persons in such manner that the Purchaser is indemnified under the policy, but the Contractor shall require such Sub-Contractor to produce to the Engineer when required the policy, the receipt for the premiums or satisfactory evidence of insurance cover.

#### **20.4 Damage Notification Period**

All events or occurrences, by which a claim on insurer will result, shall be notifiable within a period of sixty (60) days from the date of receipt Plant, Equipment or Materials at site or from the date of occurrence of the events. This period shall be further extensible as required in the event of Packages of supplies not being opened at specified rates of premium.

#### **20.5 Remedy on Failure to Insure**

If the Contractor shall fail to effect and keep in force the insurance referred to in these Conditions the Purchaser may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the Purchaser from any moneys due or which may become due to the Contractor under the Contract or recover the same as a debt from the Contractor from any other moneys due or becoming due to the Contractor.

**21.0 Compliance with Statutes, Regulations etc.**

The Contractor shall, in all matters arising in the performance of the Contract, conform in all respects with the provisions of any Central or State Statute, Ordinance or other Law or any Regulation or By-Law of any local or other duly constituted authority that shall affect the Contractor in the performance of his obligations under the Contract and shall keep the Purchaser indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance, Law, Regulation or By-Law.

**22.1 Patent Rights etc.**

The Contractor shall fully indemnify the Purchaser against all claims and proceedings for or on account of infringement of any letters, patent, registered design, copy right, trade mark or trade name or industrial property right protected in the Contractor's country or in India arising by reason of the construction of the Works or by the use of any Plant supplied by the Contractor, but such indemnity shall not cover any use of the Works otherwise than for purpose indicated by or reasonably to be inferred from the Specification or any infringement which is due to the use of any Plant in association or combination with any other plant not supplied by the Contractor.

**22.2 Claims in respect of Patent Rights**

In the event of any claim being made or action brought against the Purchaser arising out of the matters referred to in this Clause, the Contractor shall be promptly notified thereof and may at his own expense conduct all negotiations for the settlement of the same and any litigation that may arise therefrom. The Purchaser shall not, unless and until the Contractor shall have failed to take over the conduct of the negotiations or litigation, make any admission, which might be prejudicial thereto. The conduct by the Contractor of such negotiations or litigation shall be conditional upon the Contractor having first given to the Purchaser such reasonable security as shall from time to time be required by the Purchaser to cover the amount ascertained or agreed or estimated as the case may be of any compensation damages, expenses and costs for which the Purchaser may become liable. The Purchaser shall at the request of the Contractor, afford all available assistance for the purpose of contesting any such claim or action and shall be repaid all reasonable expenses incurred in so doing.

## **GENERAL OBLIGATIONS OF THE PURCHASER**

### **23.1 Foundation**

If a building structure foundation or approach is by the Contract to be provided by the Purchaser such building structure foundation or approach shall be in condition suitable for the efficient transport, reception, installation and maintenance of the works.

### **23.2 Authority for Access**

In the execution of the Works no persons other than the Contractor, Sub-Contractors and his and their employees shall be allowed on the Site except by the written permission of the Purchaser but facilities to inspect the Works at all times shall be afforded to the Engineer and his representatives and other authorities, officials or representatives of the Purchaser.

### **23.3 Access not Exclusive**

The access to and possession of the Site referred to in Sub-Clause 1 hereof shall not be exclusive to the Contractor but only such as shall enable him to execute the Works. In respect of any space allotted to the Contractor for purposes of or in connection with the contract, the Contractor shall be a licensee subject to the following and such other terms and conditions as may be imposed by the Purchaser.

- i) that the Contractor shall pay a nominal license fee of Rs. 0.50(Rupees nil and Paisa fifty only) per year per Sq.m for plant site .
- ii) that such use of occupation shall not confer any right of tenancy of the space to the Contractor.
- iii) that the Contractor shall be liable to vacate the space on demand by the Engineer
- iv) that the Contractor shall have no right to any construction over this land without the written permission of the Engineer. In case the Contractor is allowed to construct any structure the Contractor shall have to demolish and clear the same before handing over the completed work unless agreed to the contrary.

The Contractor shall provide, if necessary, or if required on the site, all temporary access there to and shall alter, adopt and maintain the same as required from time to time and shall take up and clear them away as and when no longer required and as and when ordered by the Engineer and make good all damage done to the site.

## **HOURS OF WORK AND RATE OF PROGRESS**

### **24.1 Hours of Work**



Unless otherwise provided in the Specification the Contractor shall carry out the Works on the Site during the normal working hours generally recognised in the district. The Contractor may, after consulting with the Engineer, carry out the work at other times if it shall be practicable in the circumstances for work to be so done, and become necessary for the completion of the Works within the Time for Completion at no extra cost to the Purchaser.

#### **24.2 No Night or Sunday Work**

Unless otherwise provided in the specification no work shall be carried out on site during the night or on Sundays without the consent in writing of the Engineer or the Engineer's Representative except if the work is unavoidable or absolutely necessary for the saving of life or property or for the safety or quality of the works in which case the Contractor shall immediately advise the Engineer or the Engineer's Representative.

#### **24.3 Rate of Progress**

If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the works or any Section is at any time, in the reasonable opinion of the Engineer, too slow to ensure completion by the Time for Completion, the Engineer shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as are necessary and the Engineer may approve to expedite progress so as to complete the works or such Section by the Time for Completion. The Contractor shall not be entitled to any additional payment for taking such steps.

#### **24.4 Clearance of Site on Completion**

From time to time during the progress of the works the Contractor shall clear away and remove from the Site all surplus materials and rubbish and on completion of the Works all Contractor's Equipment and leave the whole of the Site and Works clean in a workmanlike condition to the satisfaction of the Engineer.

### **LABOUR**

#### **25.1 Engagement of Labour**

The Contractor shall make his own arrangements for the engagement of all labour local or otherwise giving reasonable regard to local conditions and save in so far as the Contract otherwise provides, for the transport, housing, feeding and payment thereof. Interstate migratory labour will not be allowed unless permitted legally.

#### **25.2 Return of Labour**

The Contractor shall furnish to the Engineer at the intervals and in the form approved by the Engineer, a distribution return of the number and description by trades of the work people employed on site for the works. The Contractor shall also submit on the 4<sup>th</sup> and 19<sup>th</sup> of every month to the Engineer a true

statement showing in respect of the second half of the proceeding month and the first half of the current month (1) the accident that occurred during the said fortnight showing the circumstances under which they happened and the extent of damages and injury caused by them and (ii) the number of female workers who have been allowed Maternity Benefit as provided in the Maternity Benefit Act, 1961 or Rules made thereunder and the amount paid to them.

### 25.3 **Minimum Wages and safety**

The Contractor shall pay to labour employed by him wages not less than fair wages as defined in the Contract Labour (Regulation and Abolition) Act, 1970 and Rules made there under. **UCIL's Safety Rules & Regulations** for contractor's employees as given in the Annexure-A will be complied strictly during the execution of various works at site. Contractor has to follow the Safety Rules & Regulations as per Indian Electricity Rules to do the electrical works. **Corporation shall not provide any safety appliances and tools & tackles under any circumstances. Contractor shall ensure the use of safety appliances during the work at site.** Contractor will take full safety measures and arrange the necessary safety gadgets / appliances, tools & tackles, helmet, gumboot, safety belt, shockproof shoe, safety suit / uniform, goggles, gloves, apron, ladders, trolley, wheel barrow, bamboos, rope, machineries, scaffolding, etc. required for the work by their own cost so as to ensure that no damage, loss or injury to corporation's personnel, contractors' personnel, third party or equipment are caused due to the work being carried out by contractor. Contractor must report in writing (duplicate) to the Engineer-In charge or Safety Officer (Mill)-UCIL immediately on becoming aware of any accident at their site.

### 25.4 **Contract Labour (Regulation & Abolition)**

The contractor shall in respect of labour employed by him comply with or cause to be complied with the Contract labour (Regulation & Abolition) Act, 1970 and Rules made thereunder in regard to all matters provided therein.

### 25.5 **Contractor to Abide by Various Acts.**

The Contractor shall comply with the provisions of the payment of wages Act., 1936, Minimum Wages Act, 1948, Employers Liability Act., 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefit Act., 1961 and Mines Act, 1952, E P F (M) ACT, 1952 or any modifications thereof or any other Law relating thereto and rules frame there under from time to time.

### 25.6 **Non-observance of Contract Labour Act**

The Engineer shall, on a report having been made by an Inspecting staff as defined under the contract Labour (Regulation) Act., 1970 and rules made thereunder, have the power to deduct the money due to the contractor any sum required or estimated to be required for making good the loss suffered

by a worker or workers by reason of non-fulfillment of the conditions of the contract for the benefit of workers, non-payment of wages or of deductions made from his or their wages which are not justified by the terms of the contract or non-observance of the said Act.

#### **25.7 Indemnity**

The Contractor shall indemnify the Purchaser against any payment to be made under and for observance of the Contract labour (Regulation and Abolition) Act, 1970 and Rules made thereunder without prejudice to his right to claim indemnity from his sub-contractors.

In the event of the Contractor committing a default or breach of any of the provisions of aforesaid Act and rules made thereunder / amended from time to time, or furnishing any information or submitting or filling any Form / Register / Slip under the provisions of the law which is materially incorrect, then on the report of the Inspecting Officer, the Contractor shall without prejudice pay to the Purchaser a sum not exceeding liabilities for such defaults including liquidated damages etc. for every default, breach or furnishing, making, submitting, filling materially, incorrect statement as may be fixed by the Labour Department and the Contractor should indemnify the Purchaser against all such liabilities.

#### **5.8 Model Rules for Labour Welfare**

The Contractor shall at his own expense comply with or cause to be complied with Model Rules for Labour Welfare as provided under the Rules framed by the appropriate government from time to time for the protection of health and for making sanitary arrangements for workers employed directly or indirectly on the works. In case the contractor fails to make arrangements as aforesaid the Engineer shall be entitled to do so and recover the cost thereof from the contractor.

Failure to comply with Model Rules for Labour Welfare, Safety Code or the provisions relating to report on accidents and to grant Maternity Benefits to female workers shall make the contractor liable to pay to the Purchaser as liquidated damages an amount not exceeding Rs. 50.00 for each default or materially incorrect statement. The decision of the Engineer in such matters based on reports from the Inspecting Officer, shall be final and binding and deductions for recovery of such liquidated damages may be made from any amount payable to the Contractor.

#### **25.9 Disorderly Conduct**

The Contractor shall at all times take all reasonable precautions to prevent any unlawful riotous or disorderly conduct by or amongst his employees and for the preservation of peace and protection of persons and property in the neighborhood of the Works against the same.

## **WORKMANSHIP AND MATERIALS**

### **26.1 Quality of Materials and Workmanship and Tests**

All plant, materials and workmanship shall be of the respective kinds specified in the Contract and in accordance with the Engineer's Instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used and shall supply samples of materials before incorporation in the works for testing as may be selected and required by the Engineer.

### **26.2 Cost of Samples and Tests**

All samples shall be supplied by the Contractor at his own cost unless otherwise specified. The cost of making any test shall be borne by the Contractor.

### **26.3 Inspection of Operations**

The Engineer and any person authorised by him shall at all times have access to the Works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the Works and the Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

### **27.1 Inspection and Testing during Manufacture**

The Contractor shall be responsible for all inspections, examinations and testing as required under this contract. The Engineer shall be entitled during manufacture to inspect, examine and witness test on the Contractor's premises during working hours the materials and workmanship and check the progress of manufacture of all plant to be supplied under the Contract and if part of the said plant is being manufactured on other premises the Contractor shall obtain, for the Engineer, permission to inspect, examine and witness test as if the said plant were being manufactured on the Contractor's premises. Such inspection, examination or witness of test if made shall not relieve the Contractor from any obligation under the Contract.

### **27.2 Date for Inspection and Testing**

The Contractor shall notify well in advance and agree with the Engineer the date and the place at which any plant/equipment including system and subsystem will be tested. The Contractor shall furnish beforehand the Quality Assurance Plan & Inspection and Test Report to the Engineer for approval. The Contractor shall forward to the Engineer duly certified copies of test readings of all tests.

#### **27.3 Certificate of Testing**

As and when Plant shall have passed the tests referred to in this Clause the Engineer shall furnish to the Contractor's certificate in writing to that effect. Issuance of such certificate shall not relieve the Contractor from any obligation under the Contract.

#### **27.4 Rejection**

If as a result of such inspection, examination or test for the Plant (other than a Test on Completion under Clause 33) the Engineer shall decide that such Plant is defective or not in accordance with the Contract he shall notify the Contractor accordingly stating in writing his objection and reasons therefor. The Contractor shall with all speed make good the defect or ensure that the Plant complies with the Contract. Thereafter, if required by the Engineer, the tests shall be repeated under the same terms and conditions save that all reasonable expenses to which the Purchaser may be put by the repetition of the tests shall be deducted from the Contract Sum.

#### **28.0 Delivery**

Unless the Engineer shall otherwise direct, no plant, equipment, component or material shall be delivered to site until the Engineer shall have issued, in respect of such Plant, a certificate under Clause 27.3 (Certificate of Testing). Likewise Plant, Contractor's Equipment, materials or structures fabricated in workshops shall be delivered to site only upon an authorisation in writing applied for and obtained by the Contractor from the Engineer.

The Contractor shall be responsible for the reception on Site of all Plant, Contractor's Equipment, workshop fabricated structures and materials delivered for the purposes of the Contract. Shipping procedures, packing and delivery notes shall be as per instructions of the Engineer unless otherwise set out in the Special Conditions.

#### **29.1 Examination of Work before Covering up**

No work shall be covered up or put out of view without the approval of the Engineer or the Engineer's Representative and the Contractor shall afford full opportunity for the Engineer or the Engineer's Representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The

Contractor shall give due notice to the Engineer's Representative whenever any such work or foundations is or are ready or about to be ready for examination and the Engineer's Representative shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such work or of examining such foundations. Such waive shall not release the contractor from any obligations under the contract.

**29.2 Uncovering and Making Openings**

The Contractor shall uncover any part or parts of the works or make openings in or through the same as the Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Engineer.

**30.1 Removal of Improper Work and Materials**

The Engineer shall during the progress of the works have power to order in writing from time to time

- (a) the removal from the Site, within such time or times as may be specified in the order, of any materials which, in the opinion of the Engineer, are not in accordance with the Contract.
- (b) the substitution of proper and suitable materials and
- (c) the removal and proper re-execution, notwithstanding any previous test thereof or interim payment therefore, of any work which in respect of materials or workmanship is not, in the opinion of the Engineer, in accordance with the Contract.

The rejected material shall lie at the site at the Contractor's risk till removal by the Contractor.

**30.2 Default of Contractor in Compliance**

In case of default on the part of the Contractor in carrying out such order, the Purchaser shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Purchaser or may be deducted by the Purchaser from any moneys due or which may become due to the Contractor.

**31.0 SUSPENSION OF WORKS**

**31.1 Suspension of work**

In the event the engineer feels necessary, he may issue a written order to the contractor for suspending the work.

If the work is not suspended for the default of the contractor, he will be entitled to extra cost incurred for giving effect to such suspension order. The

engineer shall determine the amount of such extra payment and/or extension of time under clause 35.1 to be granted to the contractor, provided the contractor applies for such extra payment and/or extension of time within 14 days from the order of suspension of the work.

If the work is suspended for the default of the contractor, he will be liable to pay the purchaser all consequential losses and damages suffered by it, owing to such suspension. Amount of losses and damages suffered shall be computed by the engineer and shall have to be intimated to the contractor within 14 days from the order of suspension of the work.

However any action under this clause by the engineer shall not prevent the purchaser from exercising any other remedy available to it under the contract.

#### 31.2 Force Majeure

Force majeure shall mean any unforeseen circumstances at site which is beyond the control of the parties to the contract e.g.; Natural disaster/calamities, war, invasion act of foreign enemies, riot and civil war.

If any party considers that any circumstances of force majeure have occurred which may affect performance of its obligation, it shall notify the other party within 14 working days and the other party may accept the contention of the party involving the force majeure closure or reject the contention in writing giving reasons written 14 days thereof.

Upon the occurrence of any circumstances of force majeure the contractor shall endeavor to continue to perform its obligations under the contract as far as possible. The contractor shall not be absolved from its obligations, which arose prior to or after the period of the force majeure event. The contractor shall notify the engineer of the steps it proposes to take including any reasonable alternative means for performance, which is free from the force majeure circumstances. However, the contractor shall take steps only at the direction of the engineer.

#### 32.0 **FORE CLOSURE OF CONTRACT IN FULL OR IN PART**

If at any time after acceptance of the tender, the Corporation shall decide to fore-close or reduce the scope of the works and hence not require the whole or any part of the work to be carried out, the Engineer-in-charge shall give notice in writing to that effect to the Contractor.

- (a) In the event, any action is taken by Purchaser in terms of clause 32.0 bearing above, the Contractor shall be paid at contract rates full

amount for works executed at site as per billing schedule and in addition, a reasonable amount as certified by the Engineer-in-charge for the items hereunder mentioned which could not be utilised on the work to the full extent because of the foreclosure.

Any expenditure incurred on preliminary site work e.g. temporary access roads, temporary labour huts, staff quarters and site office, storage, accommodation and water storage tanks.

- (b)
  - i) The Corporation shall have the option to take over Contractor's Materials or any part thereof either brought to site or of which the Contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work), provided however, the Corporation shall be bound to take over the materials or such portions thereof as the Contractor does not desire to retain. For materials taken over by the Corporation, cost of such materials shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the Contractor.
  - ii) For Contractor's materials not retained by the Corporation, reasonable cost of transportation of such materials from site to Contractor's permanent stores or to his other works, whichever is less. If materials are not transported to either of the said places, no cost of transportation shall be payable.
- (c) If any materials supplied by the Corporation are rendered surplus, the same except normal wastage shall be returned by the Contractor to the corporation at rates not exceeding those at which these were originally issued less allowance for any deterioration or damage which may have been caused whilst the materials were in the custody of the Contractor. In addition, cost of transporting such materials from site to the Corporation stores if so required by the Corporation.
- (d) Reasonable compensation for transfer of Tools & Plants from site to Contractor's permanent stores or to his other works, which ever is less. If T & P are not transported to either of the said places, no cost of transportation shall be payable. The Contractor shall if required by the Engineer-in-charge furnish to him books of account, wage books, time sheets and other relevant documents as may be necessary to enable him to certify the reasonable amount payable under this condition.

However, save as provided hereinabove, the Contractor shall have no further claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works, but which he did not derive in consequence of the fore closure of the whole or part of the works.



If in respect of any Section or portion of the works not yet taken over, the Engineer shall at any time:

- (a) decide that any work done or plant supplied or materials used by the Contractor or any Sub-Contractor is or are defective or not in accordance with the Contract, or that such Section or Portion of the Works is defective or does not fulfil the requirements of the Contract (all such matters being hereinafter in this Clause Called 'defects'), and
- (b) as soon as reasonably practicable give to the Contractor notice in writing of the said decision specifying particulars of the defects alleged and of where the same are alleged to exist or to have occurred, and
- (c) so far as may be necessary place the Plant at the Contractor's disposal, then the Contractor shall with all speed and at his own expense, make good the defects so specified. In case the Contractor shall fail so to do the Purchaser may, provided he does so without undue delay, take at the cost of the Contractor such steps as may in all the circumstances be reasonable to make good such defects. The Contractor shall be entitled to remove and retain all Plant that the Purchaser may have replaced at the Contractor's cost nothing contained in this Clause shall affect any claim by the Purchaser under Clause 35 (Delay in Completion).

#### **34.0 TESTS ON COMPLETION**

##### **34.1 Notice of Tests**

The Contractor shall submit to and agree with the Engineer initially the complete schedule of Tests on Completion. The Contractor shall give to the Engineer 21 days' notice in writing of the date after which he will be ready to make the Tests on completion as per above schedule. Unless otherwise agreed the tests shall commence within 10 days after the said date on such day or days as the Engineer shall notify the Contractor in writing.

##### **34.2 Delayed Tests**

If in the opinion of the Engineer the tests are being unduly delayed he may, by notice in writing, call upon the Contractor to commence such tests within 21 days from the receipt of the said notice and the Contractor shall commence the said tests on such days within the said 21 days as the Contractor may fix and of which he shall give notice to the Engineer. If the Contractor fails to make such tests within the time aforesaid the Engineer may himself proceed to make the tests. All tests so made by the Engineer shall be at the risk and expense of the Contractor.

##### **34.3 Facilities for Tests on Completion**

The Purchaser except where otherwise specified shall provide free of charge subject to the provisions of Sub-Clause 4 of this Clause such labour, materials, electricity, fuel and water as may be requisite and as may be reasonably demanded to carry out such tests efficiently. Lubricants and other consumables, special apparatus and precision instruments as required to carry out such tests efficiently shall be provided by the Contractor free of charge.

#### **34.4 Repeat Tests**

If any portion of the works fails to pass the tests, tests of the said Portion shall, if required by the Engineer or by the Contractor, be repeated within a reasonable time upon the same terms and conditions, save that all reasonable expenses to which the Purchaser may be put by the repetition of the tests shall be deducted from the Contract Sum.

#### **34.5 Consequences of failure to pass Tests on Completion**

If the works or any Section thereof shall fail to pass the tests on the repetition thereof under Sub-Clause 4 of this Clause the Engineer shall be entitled :

- (a) to order a further repetition of the tests under the conditions of Sub-Clause, or
- (b) to reject the works or Section thereof in accordance with Clause 33 (Defects before taking over) if the results of the tests show that the works or the Section fail to meet the performance guarantees or the agreed tolerance specified in the Contract, or if there are no such guarantees or tolerances, the results show that the works or the Section are not in accordance with the Contract or
- (c) to issue a Taking Over Certificate, if the Purchaser so wishes, subject to such reduction of the Contract Sum as may be provided in the Contract or failing such provision as may be agreed by the Purchaser and the Contractor.

#### **35.0 TIME FOR COMPLETION**

##### **35.1 Extension of Time for Completion**

If by reason of;

- (a) Force Majeure, or
- (b) Delay by any other contractor engaged by the purchaser; or
- (c) Suspension of the works under clause 31.1 or
- (d) Any other cause which in the opinion of the engineer is beyond the reasonable control of the contractor;

The contractor shall within 14 days from the occurrence of the above event causing delay, apply to the engineer in writing for extension of time. The engineer if convinced, may on receipt of such notice and supporting details; grant extension of time to the contractor in writing for the completion of the works for a period he feels is reasonable.

**35.2 Delay in Completion**

If the contractor fails to complete the works or sections thereof in accordance with the contract within the time for completion the purchaser shall be entitled on giving to the contractor notice in writing to a reduction of the contract sum as liquidated damages of an amount calculated at  $\frac{1}{2}$  % of the contract sum for each week between the time for completion and the actual date of completion but the reduction shall not in any case exceed 5% of the contract sum. Such reduction shall be to the exclusion of any other remedy of the purchaser in respect of the contractor's failure to complete the work, and shall not release the contractor for any of its other obligations under the contract.

**36.0 TAKING OVER**

**36.1 Taking-over Certificate**

As soon as the works have been completed in accordance with the Contract (except in minor respects that do not affect their use for the purpose for which they are intended and save for the obligations of the Contractor under Clause 37 (Defects) and have passed the Tests on Completion, the Engineer shall issue a certificate to the Contractor (herein called a 'Taking-Over Certificate's) in which he shall certify the date on which the Works have been so completed and have passed the said tests and the Purchaser shall be demand to have taken over the works on the date so certified whereupon title to and risk of loss of damage to the works or any Section or Portion thereof shall, subject to the provisions of Clause 18 (Liability for Accidents and Damage) and Clause 37 (Defects), pass to the Purchaser but the issue of a Taking-over Certificate shall not operate as an admission that the Works have been completed in every respect. In the event of the works being divided by the Contract into two or more Sections the Purchaser shall be entitled to take over any Section or Sections before the other or others, and thereupon the Engineer shall issue a Taking-Over Certificate in respect thereof. Save as provided in Sub-Clause 3 of this Clause the Purchaser shall not use the works or any Section or Portion thereof until a Taking-over Certificate has been issued in respect thereof.

**36.2 Taking-over by Portions**

If by agreement between the Purchaser and the Contractor any Portion of the works (other than & section or Sections) shall be taken over before the remainder of the works the Engineer shall issue a Taking-over Certificate in

respect of that Portion But this will not relieve the responsibility of the Contractor to establish the Performance Guarantee within the scope of work.

**36.3 User before Taking-over**

If by reasons of any default on the part of the Contractor, a Taking-Over Certificate has not been issued in respect of every portion of the Works within one month after the Time for Completion the Purchaser shall be at liberty to use the Works or any Section or Portion thereof in respect of which a Taking-Over Certificate has not been issued if and so long as the works or the Portion so used as aforesaid shall be reasonably capable of being used provided that the Contractor shall be afforded the earliest possible opportunity of taking such steps as may be necessary to permit the issue of the Taking-over Certificate.

**36.4 Interference with Tests**

If, by reason of any act or omission of the Purchaser or the Engineer, or of some other contractor employed by the Purchaser, the Contractor shall be prevented from carrying out the Tests on Completion then, unless in the meantime the works shall have been proved not to be substantially in accordance with the Contract, the Purchaser may take over the works and the Engineer shall issue an Interim Taking-over Certificate accordingly; nevertheless the Contractor shall make the said tests during the Defects Liability Period as and when required by the Engineer by 14 days' notice in writing and Clauses 34.2, 34.3, 34.4 and 34.5 (Tests on Completion) shall apply.

**37.0 DEFECTS AFTER TAKING OVER**

**37.1 Defects Liability Period**

In these Conditions the expression 'Defects Liability Period' shall mean the period stated in special Conditions or, if no period is stated, twelve (12) months calculated from the date certified in the Taking-Over Certificate issued in accordance with Clause 36 or, in the event of more than one certificate having been issued by the Engineer under the said Clause, from the respective dates so certified and in relation to the Defects Liability Period. The expression 'The Works' shall be construed accordingly.

**37.2 Making Good Defects**

The Contractor shall be responsible for making good with all possible speed at his expense any defect in or damage to any portion of the Works which may appear or occur during the Defects Liability Period and which arises either :

- (a) from any defective materials, workmanship or design (other than a design made, furnished or specified by the Purchaser and for which the Contractor has disclaimed responsibility giving appropriate

- reasons in writing within a reasonable time after receipt of the Purchaser's instructions) or
- (b) from any act or omission of the Contractor done or omitted during the said period.

**37.3 Notice of Defects**

If any such defect shall appear or damage occur the Purchaser shall forthwith inform the Contractor thereof stating in writing the nature of the defect or damage. The provisions of Clause 37 shall apply to all replacements or renewals carried out by the Contractor to remedy defects and damage as if the said replacements and renewals had been taken over on the date they were completed to the satisfaction of the Engineer.

**37.4 Extension of Defects Liability Period**

The Defects Liability Period shall be extended by a period equal to the period during which the Works (or that Portion thereof in which the defect or damage to which the Clause applies has appeared or occurred) cannot be used by reason of that defect or damage.

**37.5 Delay in Remedying Defects**

If any such defect or damage be not remedied within a reasonable time the Purchaser may proceed to do the work at the Contractor's risk and expense.

**37.6 Removal of Defective Work**

The Contractor may with the consent of the Engineer remove from the Site any Portion of the Works which is defective or damaged if the nature of the defect or damage is such that repairs cannot be expeditiously carried out on the Site.

**37.7 Further Tests on Completion**

If the replacements or renewals are of such a character as may affect the efficiency of the works or any portion thereof, the Purchaser may within one month of such replacement or renewal give to the Contractor notice in writing requiring that Tests on completion be made, in which case such tests shall be carried out as provided in Clause 34 (Tests on Completion).

**37.8 Conditions Applicable**

These General Conditions shall apply to all inspections, adjustments, replacements and renewals and to all tests occasioned thereby carried out by the Contractor pursuant to this Clause.

**37.9 Right of Access**

Until the final certificate of payment shall have been issued, the Contractor shall have, with the permission of the Purchaser, the right of access, during

normal working hours, at his own risk and expense, by himself or his duly authorised representatives, whose names shall have previously been communicated in writing to the Engineer, to all parts of the works for the purpose of inspecting the working thereof and to records of the working and performance thereof for the purpose of inspecting the same and taking notes therefrom. Subject to the Engineer's approval, the Contractor may at his own risk and expense make any test which he considers desirable.

**37.10 Contractor to Search**

The Contractor shall, if required by the Engineer in writing, search for the cause of any defect, imperfection or fault under the directions of the Engineer. Unless such defect, imperfection or fault shall be one for which the Contractor is liable under the Contract the cost of the work carried out by the Contractor in searching as aforesaid shall be borne by the Purchaser. But if such defect, imperfection or fault shall be one for which the Contractor is liable as aforesaid, the cost of the work carried out in searching as aforesaid shall be borne by the Contractor.

**37.11 Gross Misconduct**

'Gross Misconduct' means an act or omission on the part of the Contractor implying either a failure to pay due regard to serious consequences which a conscientious and reasonable contractor would normally foresee as likely to ensure, or a deliberate disregard of any consequences of such act or omission.

**38.0 VARIATIONS**

**38.1 Engineer's Power to Vary**

The Contractor shall not alter any of the works except as directed in writing by the Engineer. The Engineer shall have full power, subject to the provision hereinafter contained, from time to time during the execution of the Contract by notice in writing to direct the Contractor to alter, amend, omit, add to or otherwise vary any of the Works. The Contractor shall carry out such variations and be bound by the same conditions, so far as applicable, as though the said variations were stated in the Specification. Provided that no such variation shall, except with the consent in writing of the Contractor be such as will, with any variations already directed to be made, involve a net addition to or deduction from the Contract Sum of more than fifteen (15) percent thereof. In any case in which the Contractor has received any direction from the Engineer which either than or later will, in the opinion of the Contractor, involve an addition to or deduction from the Contract Sum the Contractor shall as soon as reasonably possible and where practicable, before proceeding therewith, advise the Engineer in writing to that effect. The amount to be added to or deducted from the Contract Sum shall be ascertained and determined in accordance with the rates specified in the schedules of prices, so far as the same may be applicable, and where rates

are not contained in the said schedules or are not applicable such amount shall be such sum as is worked out on the basis of prevailing market rates and contractors' overhead.

**38.2 Orders for Variations to be in Writing**

No such variations shall be made by the Contractor without an order in writing of the Engineer. Provided that no order in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause, but is the result of the quantities exceeding or being less than those stated in the bill of quantities. Provided also that if for any reason the Engineer shall consider it desirable to give any such order verbally, the Contractor shall comply with such order and any confirmation in writing of such verbal order given by the Engineer, whether before or after the carrying out of the order, shall be deemed, to be an order in writing within the meaning of this Clause. Provided further that if the Contractor shall within 7 days confirm in writing to the Engineer and such confirmation shall not be contradicted in writing within 21 days by the Engineer, it shall be deemed to be an order in writing by the Engineer.

**38.3 Claims for Additional Payment for Variations**

The Contractor shall send to the Engineer, once in every month, an account giving particulars (as full and detailed as possible) of all claims for any additional payment to which the Contractor may consider himself entitled and of all extra or additional work ordered by the Engineer which he has executed during the preceding month. No claim for payment (interim or final) will be considered unless included in such account.

**38.4 Variations Exceeding Fifteen (15) Percent**

If, with the consent in writing of the Contractor and the Purchaser, the total value of all variations ordered under the provisions of this clause exceeds 15 percent of the Contract sum, the Contract sum shall be amended by such sum as shall be agreed upon between the Engineer and the Contractor. In the event of disagreement the Engineer shall fix such sum as shall in his opinion be reasonable and proper, having regard to all material and relevant factors including the Contractor's non-costs and overheads.

**39.0 VESTING OF PLANT AND CONTRACTOR'S EQUIPMENT**

**39.1 Ownership of Plant**

Plant, equipment, component and material supplied or to be supplied pursuant to the Contract shall become the property of the Purchaser at whichever is the earlier of the following times :

- (a) when Plant is appropriated to the Contract ;

- (b) when by virtue of Clause 31 (Suspension of works) the Contractor become entitled to require that the Contract Price of Plant be included in an interim certificate; or
- (c) when plant is delivered pursuant to the Contract.

#### **39.2 Marking of Plant**

Where the property in Plant passes to the Purchaser prior to the delivery of such Plant the Contractor shall so far as is practicable and to the reasonable satisfaction of the Engineer set the Plant aside and mark the Plant as the property of the Purchaser. In the event of the Contractor failing so to set aside and mark the Plant as aforesaid the Engineer shall be entitled to withhold any interim certificate to which the Contractor may otherwise be entitled.

Such Plant shall be in the care and possession of the Contractor solely for the purposes of the Contract and shall not be within the ownership or disposition of the Contractor and any interim certificate issued by the Engineer shall be without prejudice to the exercise of any power of the Engineer contained in the Contract to reject Plant which is not in accordance with the Contract and upon any such rejection the property in the rejected plant shall immediately revert to the Contractor.

#### **40.1 Removal of Contractor's Equipment**

All Contractor's Equipment Constructional Plant, Temporary works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof, except for the purpose of moving it from one part of the Site to another, without the consent in writing of the Engineer, which shall not be unreasonably withheld.

#### **40.2 Loss or damage to Contractor's Equipment**

The Contractor shall be liable for loss of or damage to any of the Contractor's equipment which may happen otherwise than through the default of the Purchaser.

#### **40.3 Other Conditions**

Any other conditions affecting Contractor's equipment shall be set out in Special Conditions.

#### **41.0 CERTIFICATE AND PAYMENT**

##### **41.1 Certificate for Payment**

The Contractor may at the times and in the manner following apply for interim and final certificates for claiming payment as referred to in Clause 42



(Terms of Payment) for Plant delivered to the site and for work executed on the site.

A detail billing schedule indicating break up of works , showing separately, where applicable, delivery, construction, erection and commissioning and value thereof along with sequence of execution shall be submitted by the Contractor immediately after award of the Contract. The Contractor shall get the billing schedule approved by the Purchaser well in advance of submitting any application for interim certificates, otherwise any interim certificate may be withheld.

#### **41.2 Application for Interim Certificates**

Applications for interim certificates may be made to the Engineer in respect ;of each delivered Plant and from time to time as work on the Site Progresses.

Each such application shall state the amount claims and shall set forth in detail, in the order of the schedule of prices, particulars of the work executed on the site and of the Plant delivered to the Site Pursuant to the Contract to a date named in the application and since the period covered by the last preceding certificate, if any.

#### **41.3 Issue of Interim Certificates**

The Engineer shall issue to the Contractor an interim certificate within one month after receiving an application therefor in accordance with Sub-Clause 2 of this Clause which the Contractor was entitled to make.

#### **41.4 Value of Interim Certificates**

Every interim certificate shall certify the total value of plant delivered to the Site or as the case may be of the work duly executed on the site and of the Plant delivered to the site for use in the works pursuant to the Contract up to the date named in the application for the certificate, less the total of any sums previously certified in interim certificate, provided that no sum shall be included in any interim certificate in respect of any works that, according to the decision of the Engineer, does not comply with the Contract, or has been brought and is at the date of the certificate prematurely upon the Site.

#### **41.5 Withholding Interim Certificates**

An interim certificate may not be withheld on account of defects of a minor character which are not such as to affect the use of the works or of any Portion thereof.

#### **41.6 Advance and Progress Payments**

If the Contract provides for progress payments or other payments in advance, before or during manufacture or before delivery details shall be given in Special Conditions and any amounts becoming due to the

Contractor in respect thereof shall be included in interim certificates. The making of payments pursuant to this Sub-Clause shall be subject to the Contractor procuring financial assurance by means of the bond or guarantee of an Insurance company or bank or other securities approved by the Purchaser the details and terms of which shall be stated in Special Conditions.

**41.7 Effect of Interim Certificates**

No interim certificate shall be relied upon as conclusive evidence of any matter stated therein nor affect or prejudice any right of the Purchaser or the Contractor against the other.

**41.8 Final Certificate of Payment**

Application for the final certificate may be made to the Engineer after the Contractor has ceased to be under any obligation under Clause 37 (Defects) provided that, if a Taking-Over Certificate has been issued in respect of any Section or Portion of the works, the Contractor may apply for a separate final certificate at any time after the said obligation has ceased in relation to such section or portion. There the Contractor has carried out replacements or renewals to the works in compliance with Clause 37 (Defects) the Contractor's obligations shall continue as provided in Sub-Clause 37.3 but the right of the Contractor to apply for a final certificate other than for the replacements or renewals shall not be affected by that fact and after the Contractor has ceased to be under any obligation under Clause 37 (Defects) in respect of the replacements or renewals he may apply for a final certificate in respect thereof.

**41.9 Issue of Final Certificate**

The Engineer shall issue to the Contractor a final certificate within two months after receiving an application thereof which the Contractor was entitled to make.

**41.10 Value of Final Certificate**

A final certificate shall certify the total of all amounts comprised in interim certificates previously issued in respect of the works or the Section or Portion thereof to which the final certificate relates subject to such additions thereto or deductions therefrom as may be authorised under Sub-Clause 12 of this Clause.

**41.11 Final Certificate Conclusive**

A final certificate shall, save in the case of fraud or dishonesty relating to or affecting any matter dealt within the certificate be conclusive evidence as to the sufficiency of the works and of the value thereof unless any proceedings arising out of the Contract whether under Clause (Arbitration) or otherwise

shall have been commenced by either party before the final certificate has been issued or within three months thereafter.

**41.12 Adjustment to Certificate**

If any sum shall become payable to the Contractor under the Contract otherwise than for work executed or Plant delivered the amount thereof shall be included in the next certificate (interim or final) issued by the Engineer and if any sum shall become payable under the Contract by the Contractor to the Purchaser, prior to the issue of the final certificate, whether by deduction from the Contract Sum or otherwise, the amount thereof shall be deducted in the next certificate.

**41.13 Corrections to Certificates**

The Engineer may in any certificate give effect to any correction or modification that should properly be made in respect of any previous certificate.

**PAYMENT CONDITIONS**

**42.0 Terms of Payment**

**It is available in commercial terms and condition.**

**43.0 REMEDIES AND POWER**

**43.1 Default of Contractor**

If the Contractor shall become bankrupt, or have a receiving order made against him, or shall present his petition in bankruptcy, or shall make an arrangement with or assignment in favour of his creditors, or shall agree to carry out the Contract under a committee of inspection of his creditors or, being a corporation, shall go into liquidation (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or if the Contractor shall assign the Contract, without the consent in writing of the Purchaser first obtained, or shall have an execution levied on his goods, or if the Engineer shall certify in writing that in his opinion the Contractor.

- (a) has abandoned the Contract, or
- (b) without reasonable excuse has failed to commence the works or has suspended the progress of the works for twenty-eight days after receiving from the Engineer written notice to proceed, or
- (c) has failed to remove materials from the Site or to pull down and replace work for twenty eight (28) days after receiving from the Engineer written notice that the said materials or work had been condemned and rejected by the Engineer under these conditions, or

- (d) despite previous warnings by the Engineer, in writing is not executing the works in accordance with the Contract, or is persistently or flagrantly neglecting to carry out his obligations under the Contract, or
- (e) has, to the detriment of good workmanship, or in defiance of the Engineer's instructions to the contrary, sub-let any part of the Contract.

Then the Purchaser may after giving fourteen days' notice in writing to the Contractor, enter upon the Site and the Works and expel the Contractor there from without thereby voiding the Contract, or releasing the Contractor from any of his obligations or liabilities under the Contract, or affecting the rights and powers conferred on the Purchaser by the Contract and may himself complete the works or may employ any other contractor to complete the works. The Purchaser or such other Contractor may use without being responsible Contractor for fair wear and tear for such completion so much of the contractor's equipment, Constructional Plant, Temporary Works and materials, which have been deemed to be reserved exclusively for the execution of the Works, under the provisions of the Contract, as he or they may think proper and the Purchaser may at any time, sell any of the said Contractor's Equipment, Constructional Plant, Temporary Works and unused materials and apply the proceeds of sale in or towards the satisfaction of any sums due or which may become due to him from the Contractor under the Contract.

#### **43.2 Valuation at Date of Forfeiture**

The Engineer shall, as soon as may be practicable after any such entry and expulsion by the Purchaser, fix and determine experts, or by or after reference to the parties, or after such investigation or inquiries as he may think fit to make or institute and shall certify what amount, if any, had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract and the value of any of the said unused or partially used materials, any Constructional Plant and any Temporary Works.

#### **43.3 Payment after Forfeiture**

If the Purchaser shall enter and expel the Contractor under this Clause, he shall not be liable, to pay to the Contractor, any money on account of the Contract until the expiration of the Defects liability period and thereafter until the costs of execution and maintenance, damages for delay in completion, if any and all other expenses incurred by the Purchaser have been ascertained and the amount thereof certified by the Engineer. The Contractor shall then be entitled to receive only such sum or sums, if any, as the Engineer may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon demand, pay to the Purchaser the amount of such

excess and it shall be deemed a debt due by the Contractor to the Purchaser and shall be recoverable accordingly.

#### **44.0 URGENT REPAIRS**

If, by reason of any accidents or failure, or other event occurring to in or in connection with the works, or any part thereof, either during the execution of the works, or during the Defects liability period, any remedial or other work or repair shall, in the opinion of the Engineer or the Engineer's Representative, be urgently necessary for the safety of the works and the Contractor is unable or unwilling at once to do such work or repair, the Purchaser may employ and pay other persons to carry out such work or repair as the Engineer or the Engineer's Representative may consider necessary. If the work or repair so done by the Purchaser is work which in the opinion of the Engineer, the Contractor was liable to do at his own expense under the Contract, all expenses properly incurred by the Purchaser in so doing shall be recoverable from the Contractor by the Purchaser, or may be deducted by the Purchaser from any moneys due or which may become due to the Contractor. Provided always that the Engineer or the Engineer's Representative, as the case may be shall as soon after the occurrence of any such emergency as may be reasonably practicable notify the Contractor thereof in writing.

#### **45.0 TERMINATION OF CONTRACT**

##### **45.1 Due to Prolonged Delay**

If even after of the maximum reduction of 5% under clause 35(2), i.e. after expiry of ten weeks, from the scheduled date of completion, the work still remains incomplete, the purchaser may by notice in writing to the contractor, terminate the contract and may get the contract executed itself or by any other party for which the contractor shall be liable to pay the purchaser for all extra cost incurred and consequential losses suffered by purchaser by reason of the failure of the contractor to complete the work.

##### **45.2 For Corrupt and Fraudulent Practice**

If the contractor; fraudulently, offers or give or agree to give to any person in corporation's service or to any other person on his behalf any payment, compensation, consideration, gift or any kind of inducement or reward for doing or forbearing to or for having done or forborne to do any act in relation to the obtaining or execution of this contract for the Corporation, the purchaser by written notice may terminate the contract.

##### **45.3 For attachment of plants, machineries & equipments at site**

The purchaser may terminate the contract in writing if the contractor, suffers any order attachment passed by any court in respect of the plants, equipment's, machineries and tools etc. engaged in the site of the purchaser by the contractor and such attachment order continues for a period of more than 21 days.

45.3.1 **For Non Performance of terms and conditions of the contract.**

If the contractor fails to perform its duties and obligation as laid down in the contract or despite previous warnings by the Engineer, in writing is not executing the works in accordance with the Contract, or is persistently or flagrantly neglecting to carry out his obligations under the Contract, the Engineer shall give notice in writing to the contractor and direct the contractor to rectify its defect or latches within 30 days from the date of the notice. If even after the expiry of 30 days the contractor fails to rectify its defects/latches the purchaser may terminate the contract in writing.

In the event of termination of the contract as aforesaid in terms of clauses 45(2),(3) and/ or (4) above, the contractor shall be liable to compensate the purchaser for all consequential losses and damages suffered by it.

46.0 **DISPUTE AND ARBITRATION**

46.1 **Dispute**

If at any time any questions, dispute or difference (hereinafter referred to as a "Dispute" ) shall arise between the Purchaser and the Contractor, either party shall, as soon as reasonably practicable, give to the other notice in writing of the existence of such Dispute specifying its nature and the point of issue. The parties shall attempt, within a period of sixty (60) days after receipt by one party of a notice from the other party of the existence of the Dispute, to settle such Dispute amicably in the first instance by mutual discussions between the parties.

46.2 **Arbitration**

Notwithstanding anything contained in this Contract, all questions, disputes or differences whatsoever which is not amicably settled as per clause no 46.1 above, between the parties to the Contract, arising out of or relating to the construction, meaning and operation or interpretation of provision of the Contract or matters related thereto whether during the currency of the Contract or its failure or after the completion of the Contract, shall be referred to the adjudication of Sole arbitrator to be nominated and appointed by the Chairman and Managing Director of the Purchaser. It will be no objection to any such appointment even if the Arbitrator so appointed is an employee of the Purchaser.

The award of the Sole Arbitrator shall be final and binding on the parties and the provisions of The Arbitration and Conciliation Act, 1996 and Rules made there under shall be applicable to the arbitration proceedings under this clause. It is a term of the contract that the party invoking arbitration shall specify the disputes to be referred to arbitration under this clause with details in respect of each of such disputes.

46.3 **Work to continue**

Work under the contract shall be continued by the Contractor during the arbitration proceedings, unless otherwise directed in writing by the Purchaser or the Engineer or unless the matter is such that the works cannot possibly be continued until the decision of the arbitrator is obtained and except as those which are otherwise expressly provided in the contract, no payment due or payable by the purchaser shall be withheld on account of such arbitration proceedings unless it is the subject matter or one of the subject matters thereof.

#### **47.0 NOTICES**

##### **47.1 Notices to Contractor**

All certificates, notices or written orders to be given to the contractor by the Purchaser or the Engineer under the terms of the Contract shall be served by sending the same by registered post or fax to or leaving the same with acknowledgement thereof at the Contractor's principal place of business or to such other address as the Contractor shall nominate for that purpose.

##### **47.2 Notices to Purchaser and Engineer**

Any notice to be given to the Purchaser or to the Engineer under the terms of the Contract shall be served by sending the same by registered post or fax to or leaving the same with acknowledgement thereof at the respective addresses to be nominated for that purpose.

##### **47.3 Change of Address**

Either party to the Contract or the Engineer may change its nominated address by prior written notice to the others.

#### **48.0 MISCELLANEOUS**

##### **48.1 Endorsement of Terms**

The failure of either party to endorse at any time of the provision of the contract or any rights in respect there to or to exercise an option herein provided shall in no way be construed to be waiver of such provisions, rights or option or in any way to affect the validity of this Contract. The exercise by either party of any of its rights herein shall not preclude or prejudice either party from exercising the same or any other right it may have.

#### **49.0 Special Conditions**

1. The installation jobs also comprise of removal of scrap generated to scrap yard. The work place should be kept clean and all left out material should be disposed properly every day as per instruction of the Engineer In charge, UCIL. . **If**

**contractor fails to remove the scrap or materials within 7 (seven) days, it will be done through any other agency at contractor's risks & costs.**

2. Power connection to one points for distribution board provided by the contractor within 100 meters radius of work-site. Power supply will be chargeable

3. **Scope of supply of UCIL - free of cost:**

Water and lighting facility as per availability.

#### Annexure A

#### SAFETY OF CONTRACTOR'S EMPLOYEES

1. The contractor shall at all times, take all reasonable precaution for the safety of employee, including those of sub – contractors in the performance of his contract and shall comply with all applicable provisions of both Central as well as the State Safety Laws. In addition to the safety provisions, the contracting officer shall include the SAFETY requirements as RECOMMENDED by the Health Physics Unit, Turamdih for a specified contract. In the event that contractor fails to comply with these provisions, the contracting officer may, without prejudice to any other legal or contractual rights, issue an order for stopping all or any part of the work, thereafter a start order for resumption of work may be issued at the sole discretion of the Contracting Officer. The contractor shall make no reason of or in connection with such stoppage.

2. Contractor shall have a full time Safety Officer / Engineer when the contractor employ 500 or more persons or when engaged specifically in hazardous work.. In the case of contractors employing fewer than 500 persons , his safety representative shall be an employee in a high supervisory capacity and his safety duties may be in addition to his other technical / administrative duties.

3. Contractor shall have at least one person fully trained in First Aid to be present at the site of work all time.

4. Contractor must report to the Safety Officer (Mill) – through their contracting officer every accident involving

- Their personnel
- UCIL property or personnel.
- Property or personnel of other contractors working at the site.

4.1 Contractor must report to the Safety Officer (Mill) immediately on becoming aware of any accident of Type - A (see Appendix –1) giving the following information :-



- Name of the informant
- Nature and location of incident being reported
- Name of Supervisor / Engineer – In charge, location and telephone no. where he can be reached.

4.1.1 Contractor shall submit their investigation reports , through their contracting officer , to the Safety officer (Mill) immediately but not later than 3 (three) working days after the occurrence of accident in the Form – A (see Appendix - 2)

4.1.2 In the case of Type – B accidents ( see Appendix – 1) , Contractors shall submit their investigating reports , through their contracting officer , to the Safety officer ( Mill) immediately but not later than 3 (three) working days after the occurrence of accident in the Form – A .

4.3 Monthly summary of accidents and cases of fire shall be prepared by each contractor in Form – B ( see Appendix – 3) and be sent to the Safety officer ( Mill) by the 7<sup>th</sup> of the next month.

4.3.1 Prime contractor reports shall include the man days lost and occurrence of accident under the jurisdiction of the Sub Contractors.

4.3.2 Contractors shall submit a narrative on safety activities and fire incidents for each month along with Form – B. The review should contain such items as Personnel and programme change, major project started and major problem.

## APPENDIX – 1

### CLASSIFICATION OF ACCIDENTS

#### TYPE – A

1. Fatal injury.
2. Serious injuries such as fracture, dislocation, severe burns etc. necessitating hospitalisation.
3. Any injury to five or more persons.
4. Accidents resulting in damage by fire , Explosion etc.

#### TYPE – B

1. Minor injuries which results in laceration, abrasion, contusion etc.
2. Disabling injuries but not requiring hospitalisation.

## APPENDIX – 2

### ( FORM – A) ACCIDENT INVESTIGATION REPORTS

Name of contractor and project :  
Nature of contract :  
Name of Engineer Incharge :  
Name of injured person :  
Age :  
Address :

Date and Time of accident :  
Place where accident occurred :  
Nature of job :

What was injured person doing :  
at the time of accident

Description of accident ( in detail) :

Nature of injuries :  
What was defective or in wrong :  
condition that was responsible  
for the accident  
What was wrong with working :  
methods / instructions  
What steps should be taken :  
to prevent reoccurrence of  
such accidents

Name of witness : 1.  
2.

Safety representative's remarks  
with signature and date

(FORM –B)

SUMMARY OF ACCIDENT FOR THE MONTH OF .....

Name of the contractor :

Name of project :

Name of the sub – contractor :

Name of safety representative  
of the project:

Total nos. of persons working in the project.	<u>Male</u>	<u>Female</u>
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Engineers

Supervisors

Labours

Total nos. of accidents  
(including Type A & B)

Disabling injuries

Non – disabling injuries

( Signature & stamp of Contractor)

cc: Engineer – Incharge

cc: Safety officer, UCIL (MILL)

**PACKAGE NO. MBM-01**

**SECTION: III**

**TECHNICAL SPECIFICATION**

**PACKAGE NO. MBM-01**

**FOR**

**MAGNETITE BALL MILL**

PACKAGE NO. MBM-01

**SECTION: III /1**

**TECHNICAL SPECIFICATION : PROCESS/MECHANICAL**

PACKAGE NO. MBM-01

FOR

MAGNETITE BALL MILL



**TECHNICAL SPECIFICATION FOR MAGNETITE BALL MILL**

**Process description:**

Barren neutralized pulp from the neutralization tank is fed to rougher magnetite circuit through a feed distributor. **Rougher** drums will separate out magnetic materials as concentrate and the non-magnetic part will report as tailing. This Rougher tailing will be subjected to magnetite recovery process in **Scavenger** drums to produce scavenger concentrate. The final tailings from scavenger circuit will be sent to sand separation plant. Magnetite concentrates obtained from both rougher and scavenger circuits will be taken into Ball mill discharge sump. The combined concentrate will be pumped to a **hydro cyclone** for classification. The coarse fraction i.e. cyclone underflow will be fed to a **Ball Mill** for further grinding. Fines fraction obtained from the hydro cyclone as overflow will be sent to a **cleaning** circuit drum for upgrading the magnetite. The upgraded concentrate thus obtained will be the Final Product which will be stored in a paddock for water removal. The tailing from cleaner drum will be recycled to feed distributor. The water which decants from the paddock will contain some quantity of magnetite. Decant water will be pumped to **clarifier** for magnetite recovery and to recycle the water which will be used in the process stream.

## Battery limit

### INPUT:

- Output of Rougher circuit as magnetite concentrates to the mill discharge tank.
- Process water to mill and other required area from clarifier overflow tank.
- The purchaser shall provide 6.6 KV H.T. breaker for operation of H.T. Mill motor and L.T. power supply shall be given to the M.C.C. panel .

### OUTPUT:

- Discharge of hydro cyclone battery overflow to cleaner drum feed inlet tundish .

### List of equipments:

SL.No.	EQUIPMENT DESCRIPTION	QUANTITY
1	Ball Grinding Mill [Complete with motor ,HT switch gear, grid resistance starter, APFC panel for P.F Improvement, gear box, auxiliary drive arrangement, HI- lift system , mounting arrangement ,grid resistance starter and other related accessories]	1 No.
2	Mill discharge sump (MSRL) .The rubber used shall be soft rubber.	2 No.
3	Feed pumps to hydrocyclone with VVFD drive( 1 No. running and 1 No. stand-by complete with motor , drive arrangement , base plate, supporting frames and structure )	2 No.
4	Hydrocyclone with feeding arrangement [ 4 no.] 2 set cyclone for each mill discharge pump	4 no.
5	Hydrocyclone underflow trough (MSRL )whose discharge will go to mill as feed	1No.
6	Hydrocyclone overflow discharge tundish (MSRL) and Hydrocyclone underflow tundish .The rubber used shall be soft rubber.	2 No.
7	M.C.C. [For normal supply] & local push button station	1 set
8	Mill area sump pump complete with motor	2 No.
9	All the required instrumentation	1 lot
10	Any other equipment required.	

- Poly phase air cooled grid resistance rotor starters shall be provided for 6.6KV. slip ring motors below 750KV



- Mill discharge sump should be provided with drain (with valve) and overflow pipe.

Annexure-1

**List of feeders to be accommodated in new M.C.C.**

Sl. No.	Equipment description	No. of feeders required	Remarks
1	Hydrocyclone feed pumps	02 Nos.	To be given by bidder
2	Inching drive	01 No.	To be given by bidder
3	Sump Pump	02 No.	To be given by bidder
4	Recycle water pumps	02 Nos.	To be given by bidder
5	Hi-lift motor	02 Nos.	To be given by bidder
6	Spare feeders	02 Nos.	02 Nos. 10 HP each
7	Air compressor for spray lubrication	02 Nos.	To be given by bidder
8	Any other feeder required to accommodate in the MCC but not mentioned specifically for the grinding mill quoted by the bidder		

MCC shall have minimum 20% spare feeders

## **CONTROL PHILOSOPHY:**

Magnetite concentrate recovered from rougher circuit containing magnetite and gangue material is feed directly to Mill discharge sump, this slurry is pumped to hydrocyclone through Hydrocyclone feed pump where separation of finer and coarser material takes place, the finer material (Overflow) is fed to cleaner circuit and underflow is sent to mill as feed for grinding to achieve required size and liberation of gangue.

## **MECHANICAL AND PROCESS EQUIPMENT**

### **Introduction**

This section is intended to provide a general guideline for design, manufacture and supply of various major mechanical /process equipment. The equipment offered shall be in compliance, as far as possible, with the general design features specified in this section supplemented by the stipulations provided in the respective 'Equipment Data Sheet' of this specification document.

Each equipment shall be provided with permanent nameplates in English bearing manufacture, equipment number and necessary instructions for safe and satisfactory operation.

## **1. Centrifugal Pump**

### **General Information**

Pumps shall be provided for handling clear water and slurry. The exact location and operating parameters shall be guided by the plant/equipment layout and respective Equipment Data Sheets.

Casing should be encased with rubber and impeller shall be made of CSRL. Shaft shall be of EN-8 and shaft sleeve CA-40.

The pumps shall be designed, fabricated, inspected and tested in accordance with the provisions for this specification.

The design, manufacturing, testing and inspection of pumps should conform to IS-1520, IS-5120, IS-9137, ISO 3555, BS 5316, IS 2548, IS 4722, IS 6362, IS 5639, IS 5659, API – 610, API – 682, ASTM-E-165, ASTM-E-114, ISO – 1940, Hydraulic Institute Standard.

The materials of construction of the various components shall conform to the applicable IS/ASTM or other acceptable international standard.

## **General Design Features**

### **i. Capacity and Size**

The rated head capacity conditions of the pumps shall be selected based on the process requirements and plant/equipment layout offered by the tenderer.

The design shall enable to attain best efficiency at the specified duty condition and shall be suitable for continuous operation at any point in the head capacity curve.

The head capacity characteristics of the pumps shall be suitable designed to have no zone of instability up to the maximum point at shut o

For variable speed pumps, the design should be such that it operates at a constant efficiency along the entire range of speed variation.

The design of pumps shall emphasize upto maximum possible interchangeability of components.

Wherever required, the pumps shall be suitable for parallel operation with matching characteristics to ensure equal load sharing and trouble free operation throughout the range.

### **ii. Casing**

The pump casings shall be designed to withstand the maximum shut off pressure of 150% of the maximum pumping pressure under which the pump can operate at rated condition, whichever is higher.

The pump casings shall be provided with adequate number of vent and priming connections with valves, if necessary, unless the pump is self venting and self priming type. Casing drain with drain valves shall be provided as necessary.

All suction and discharge connections shall be flanged type. Suitable corrosion allowances shall be provided in the casing thickness. The casing design should be such that, the pump internals can be serviced and approached easily without disturbing suction and discharge piping connections.

### **iii. Impeller**

Impellers shall be threaded to pump shaft.. For pumps with overhung shaft, impellers shall be additionally secured to the shaft by a cap screw or locknut. Impeller shall be made in one piece. All screwed fasteners shall tighten in the direction of normal rotation of the pump. The impeller shall be CSRL

Impellers shall be closed or semi-open type depending on the material to be handled. The impeller and shaft assembly shall be statically and dynamically balanced.

Design of pump shall take care to minimum or eliminate end thrust.

#### **iv. Wearing Rings**

Replaceable type wearing rings shall be provided to safe guard impeller and casing, with close tolerance to minimize recirculation flow.

#### **v. Impeller Shaft**

Impeller shaft shall be made from graded quality steel and shall be distortion free. The shaft shall have replaceable fine finished concentric sleeves at the stuffing boxes/mechanical seals.

#### **vi. Bearings and Pillow Blocks**

Bearings and other hydraulic devices shall be designed to take the entire pump load arising from most adverse conditions of continuous operation throughout its range of operation including the shut-off condition. Bearing pedestals shall be cast integral or supported from the lower half of the pump casing and shall be fitted with heavy duty standard make bearings to carry both axial and radial loads. The life of each bearing shall be minimum 100,000 hours of continuous operation at rated conditions.

Proper lubrication system shall be provided for the bearings and the design shall ensure that the lubricant does not contaminate the fluid being pumped. All bearings must be protected against dust, water ingress and grease leakages. Bearings shall be easily accessible without disturbing the pump assembly.

#### **vii. Stuffing Boxes**

Stuffing boxes with packing, mechanical seal or hydraulic seal shall be used as suitable for the type of pump considered. Generally, for slurry pumps hydraulic seals will be preferred. Seal water pumps shall be provided as required for gland sealing.

The design shall permit replacement of packing without removing any part other than the gland.

#### **viii. Base Plate**

Pump with drive motor and drive arrangement shall preferably be mounted on a common base plate (Piggy or zigzag preferable) .

#### **ix. Others**

##### **• Drive**

Drive motor shall be adequate margin over the rated power requirement to cater the maximum power during the severest operating conditions. For variable speed pumps, the drive motor shall be of infinitely variable AC drive type within the range of operation.

- **Coupling**

For direct driven pumps, flexible Pin Bush type couplings shall be used.

- **Safety Guards**

All exposed rotating parts and belts shall be protected by safety guards as required.

## **2 Grinding Mill**

### **General Information**

Ball mill shall be provided for grinding Magnetite concentrate from magnetic drum separator to the required degree of fineness.

The design procedures shall follow established standard design practices for wet overflow type Ball mill.

The ball mill will operate in close circuit with single stage hydro cyclone classification.

The design shall be such that, over and above the normal operating conditions, the mill can impart additional energy to the magnetite concentrate to be ground by changing grinding media charge or such other operating parameters without affecting the installation. However, with a view to avoid the undesirable eventualities of under/over grinding, the mill charge factor is to be considered as 40%.

### **General Design Features**

#### **i. Mill Shell and Flanges**

The mill shell shall be fabricated from graded quality plate steel. Welds shall be radio graphically or ultrasonically tested and properly stress relieved. Bolt holes for fixing of liners shall be spaced and drilled accurately after rolling. The shell shall be provided with two access man-holes of adequate size located at diametrically opposite positions near the two ends. The manhole size shall be such that the largest piece of liner plate can be easily inserted through it and shall be provided with closely fitting covers.

The end flanges shall be fabricated from graded quality heavy duty steel plate and welded to the mill shell. All the welds shall be tested fully by radiography or ultrasonic method. The flanges shall preferably be first welded to the shell and then finally machined to ensure true concentricity of the shell.

The sizing of the mills shall be the supplier's responsibility and should take rubber liners into account. The sizing of the mills shall be the supplier's responsibility and should take rubber liners into account. The Ball mill shall have an L/D ratio more than 2.

## **ii. Mill Head and Trunnion**

Mill head integral with the trunnion shall be of extra heavy duty ribbed cast steel construction. Head shall be bolted to shell flanges. Mill head casting shall be properly stress relieved by adequate heat soaking. The mill head and the trunnion shall also be tested ultrasonically/ Radio-graphically for cracks/blow-holes or any other casting defects.

## **iii. Bearing**

Both the bearings shall be properly lubricated by **forced lubrication system** consisting of oil pumps with drive, oil filters, oil coolers (if necessary), adequate instrumentation and safety interlocking etc. One set of pump with suction and discharge oil filters shall be incorporated in the circuit as 100% standby. . The bearing shall have self aligning property.

Suitable arrangement shall be provided for pre-jacking of bearing before start-up with high pressure oil pumps.

## **iv. Girth gear and Pinion**

The girth gear shall be helical split type high wear resistant cast steel /fabricated construction. The teeth for both the girth gear and pinion shall be cut by forming/generating method. The gear ring sections shall be symmetrically machined so that they can be turned round to make use of both the tooth flanks. Pinion shall be manufactured from selected grade forged alloy steel and shall be properly heat treated and hardened.

Pinion shaft may be forged integral with the pinion shall be supported by heavy duty self aligning antifriction bearings housed in heavy duty pillow blocks. The pinion shaft shall be symmetrical and reversible so that both the tooth flanks of the pinions can be used. Proper lubrication system shall be provided for gear, pinion and pinion shaft bearings. Spray lubrication shall be provided for Girth Gear-Pinion. The gear ring design shall ensure good sealing with the Girth Gear cover.

## **v. Gear Box**

The gear reducer shall be of heavy duty multi stage helical suitable for continuous mill duty with heavy shock loads. The gear box housing, fabricated from steel plates, shall be properly stiffened and shall be stress relieved and radio graphically or ultrasonically tested. The thermal rating of the gearbox shall preferably be so selected as to eliminate the need of external oil cooler at all possible ambient conditions. Suitable oil seals shall be provided in bearing ends to prevent leakage of lubricant. The oil seals shall be of high quality split type for easy replacement. All bearings and tooth mesh points shall be properly lubricated by forced lubrication system with water cooling system incorporating all the requisite accessories as mentioned for mill bearing lub circuit. The gear box shall necessarily be provided with heavy duty antifriction bearings.

The drive system for all Mills shall include an inching/slow running device incorporating an auxiliary motor, gearbox, self disengaging type overriding clutch etc. This auxiliary drive shall be coupled with the double extension end of the main gear box input shaft.

#### **vi. Liner**

The mill shall be provided with liners as follows :

For Ball mill, only rubber liners shall be provided on mill shell as well as mill ends. The liners shall be 'Lifter Bar' type. The liner fixing arrangement shall ensure no leakage through bolt holes, eliminate deformation/elongation of holes and bolt breakage. The liners shall be cushioned by a film of rubber backing to enhance endurance against severe shock. However, tenderer may suggest suitable alternative arrangement.

#### **vii. Grinding Media**

It shall be electro cast or forged of alloy steel preferably of high chromium composition. Minimum average hardness of the media should be 600 BHN. Charge factor, size gradation and material shall be properly chosen to satisfy the admissible wear rate and maximum efficiency of grinding at rated conditions.

#### **viii. Others**

##### **•Couplings**

Coupling between mill drive pinion shaft and gearbox output and that between the motor and gearbox input shaft shall be curved tooth geared type.

##### **• Mill lifting Saddle support shall be an integral part of mill supporting foundation.**

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##### **•Safety Arrangements**

All rotating parts shall be provided with proper safety covers.

The motor shall be protected by overload trip mechanism.

- For Ball mill, suitable space for ball charging during operation shall be provided in the feed chute.
- Feeding to the mills shall be done directly by feed pipe and shall be provided with gland packing or other suitable arrangement to prevent slurry spill back.
- Discharge mouth shall be fitted with reverse directed internal screw and discharge trommel screen.

### **3. Piping, Valves and fittings**

#### **General Information**

Complete piping system shall be provided for handling water and slurry air. Exact pipe length, size, routing shall be guided by plant layout, general arrangement and capacity of process equipment.

#### **General Design/Selection Features**

Design of the piping systems shall be suitably done keeping in view the specific application and duty condition of the system.

##### **i. Piping**

#### **Standards**

Design, manufacture, erection and testing of all pipes, fittings and accessories shall be in full compliance with the latest edition of applicable Indian Standards. In addition, the relevant ANSI codes for pipe threads flanges, fittings etc. shall also be applicable.

All welded pipes shall be accompanied with manufacturer's certificate stating the compliance with relevant standard.

#### **Slurry Handling Pipe line**

Generally all pipe line shall have a standby pipe line. Wherever applicable sharp bends and fittings shall be avoided as far as possible. For horizontal run, the pipes shall be given a suitable slope towards the discharge end.

All the slurry pipes shall be rubber lined as per applicable code.

All the slurry pipes and fittings will be joined by flanges. Flanges shall be slip-on type for pipe sizes 50 NB and below and weld neck type for above 50 NB size. The design shall permit easy rotation of the pipe.

The minimum slurry velocity within any pipe shall be sufficient to carry all the solid particles without permitting segregation or settling.

All slurry pipes shall be of MSRL pipes.

#### **Compressed Air Pipe line**

All pipes carrying instrument and service compressed air shall be seamless galvanized carbon steel pipe conforming to SA106 Gr.B. Galvanised pipes shall be hot dipped galvanized. Coating thickness shall not be less than 0.55 kg/m. Fittings shall also be galvanized and conforming to SA 234 Gr. WCB for sizes 50NB and above and SA105 for sizes less than 50NB. Generally pipes and fittings shall be welded. Average allowable velocity for sizing compressed air (upto 7 kg/Cm<sup>2</sup>g) pipelines shall be 10-12 m/s upto 50NB line, 10-15 m/s for 50-150 NB line and 15-20 m/s for 200 NB line and above.



## **Water Handling Pipe line**

All pipes carrying service water shall be MSRL. The pipes shall have suitable protective painting outside.

Generally, pipes and fittings shall be joined by welding. Flanges shall be provided, where inspection/maintenance is deemed necessary connection with valves, orifice plates and such other fittings shall be flanged. The flanges shall be slip on type. For pipes smaller than 100 mm. NB, flanged joints will be replaced by screwed connection.

Water velocity within the pipe shall be kept at 1.2 to 1.5 m/s.

### **ii. Valves**

#### **Standards**

All valves and its accessories shall meet the requirements specified in the latest edition of relevant Indian Standard. Relevant ASTM/AISI Codes shall be followed for valve materials if suitable IS code is not available. Design testing and inspection should be as per applicable API/BS codes.

All the valves shall have removable seat rings and guide bushing. They shall be provided with hand wheel and rising stem travel indicator. They shall be sized at a flow which is at least 20% more than the maximum flow in the pipe line.

For motor operated valves, the actuator shall be sized to open or close the valve at the maximum differential pressure. The valve and actuator mounting bracket must be capable of withstanding without damage the stall torque of the actuator with torque and limit switches in operative. The actuators must be capable of operating at any angle of installation.

Wherever necessary, the valves shall be provided with chain wheels, extended spindle and floor stand so that they can be operated manually by a single operator from the nearest operating floor either at a lower or higher level as the case may be. All valves etc. shall be provided with Brass Tag Discs indicating Tag numbers and nomenclature of the valve.

#### **Valves for slurry application**

Generally, all valves in the slurry pipe line shall be remote operated Knife-edge gate-valve /pinch/ diaphragm type.

All the valves used in the slurry line shall have remote/control arrangement with local control facility.

The valve body shall be of high quality cast steel with bronze or gun metal bushes and other part. The diaphragm / Knife-edge gate-valve /pinch tube shall be of soft natural rubber or polybutadiene. Except fixing arrangement no mechanical contact shall be permitted to control the diaphragm position or pinch tube orifice.

#### **Valves for Water Application**

For water pipe line standard designs Pneumatically operated diaphragm valve shall be followed.

Wherever necessary, automatic remote valve control arrangement shall be provided in addition to local manual control arrangement.

### **iii. Pipe supports, anchors and restraints**

In general pipe supports, restraints, braces or anchors shall be located at those points in the building or outdoor where provision has been made for the loads imposed. Loads at the supporting points or restraints shall be determined sufficiently early and provisions shall be made in the building or outdoor structures for pipe supports. The Contractor shall locate, design, supply and erect all the supplementary steel structures to properly secure and support all pipe hangers, supports, restraints etc.

Provision shall be made for support of piping which may be disconnected during maintenance work. All large pipes and all long pipes shall have at least two supports each arranged in such a way that any length of piping or valve may be removed without any additional supports being required.

Supports, guides and anchors shall be so designed that excessive heat is not transmitted to the building steel. Supporting steel shall be of structural quality. Perforated strap, wire or chain shall not be used. Support components shall be connected to support steel by welding, bolting or clamping. Both holes shall be drilled and not gas cut. Structural steel work for supporting shall be designed on the basis of the maximum design stress of 1265 kg/cm<sup>2</sup>.

- The supporting structures of each support point shall be designed for the highest of the following loads to take into account the extra load during hydraulic testing.
- 1.25 times the maximum load under operating condition.

-Weight of pipeline full of water (combined weight of pipe, insulation, valve attachment etc. plus weight of water).

-Weight of pipeline full of water as above plus any cold reaction as anticipated.

### **Meters, Strainers etc.**

In line meters, strainers and major equipment that may be spared shall be valved to permit isolation and removal without the need for plant shut down. Water line strainers shall be of 'twin' type. Strainers shall have GI body with S.S. basket.

Expansion joints, if provided, shall have suitable control units consisting of at least four control rods.

### **Others**

Suitable valves (viz. tech.-taylor valves or equivalent) and arrangement shall be provided at bifurcation points in slurry pipe line in order to prevent any accumulation or fall back of slurry through the inoperative piping branch.

## **4. HYDROCYCLONE**

### **General information**

Hydrocyclone will be provided in the grinding circuit for product classification.

Design of hydrocyclone shall consider relevant plant / equipment layout and vertically installed the same.

In order to achieve a well –defined separation efficiency , suitable classification system shall be provided in the magnetite concentrate grinding circuit .Selection of appropriate type of system will be the suppliers responsibility . However, tenderer must furnish along with the tender a detailed write-up and flow for the system and equipment offered.

### **General Design/Selection Features**

The size of the hydrocyclone shall be selected from the process requirements as specified. The body of the cyclone shall be made from high quality cast steel. It shall be of fix apex design. The metal body cyclone s shall have suitable replaceable liner to minimize abrasion of the casing . The casing shall be provided with suitable mounting arrangement by bolting. The hydrocyclone shall be provided with diaphragm type pressure gauge. The hydro cyclone shall have preferably wear resistant silicon carbide apex and vortex finders. The party should also be provided with spares set of next higher and lower sizes of vortex finder and apex.

## **5. Miscellaneous Elements**

### **Launders**

#### **Material of construction**

Generally all the launders shall be fabricated from mild steel plates of minimum 6 mm. thickness and the chutes shall be fabricated from minimum 10 mm. plates - unless otherwise specified.

#### **Supports**

All the launders shall be suitably supported rigidly with structural steel sections. The supporting arrangement shall be such that, the launders can be dismantled without disturbing the supporting arrangement.

#### **Sumps and Tanks**

Sumps and tanks as required shall be unless otherwise specifically stated elsewhere, of 8 mm. thick steel plate. Steel sumps shall be of rectangular cross-section with a sloping base to facilitate pulp flow. Suitably bolted 12 mm. thick M.S. plate or rubber liners shall be provided in each sump at the point of impact of the slurry.

### **Safety Guards**

Guards for chains, V-belts or gear drives should be of expanded metal or 1/2 .

## **GENERAL**

The drive for all equipment including mill and pumps etc. shall be provided with one size higher rating motors & gear boxes than those required as per specified design consideration.

## **DRAWINGS, DATA AND MANUALS REQUIRED**

Following drawings and documents shall be submitted along with the offer:

### **Drawings**

- a) Layout and General Arrangement drawings for mill system of the subject package incorporating the following information:
  - Overall size and locating dimensions of equipment.
  - All platforms, access stairs/ladders, coverings, load beams, civil design drawings etc.
  - Equipment disposition.
  - Clearance and head room required for operation/maintenance of each equipment.
  - Other important dimensions of the individual equipment.
  - All the process pipe routing and utility pipe line routings down to 100 mm. dia.
  - Flow sheets incorporating ore and water balances for 'average' and 'design' conditions.
  - Electrical distribution diagram.
- b) Process and instrumentation diagrams covering the entire package.
- c) Material and water balance diagrams of each system covering the entire package
- d) EOT crane clearance diagrams showing various dimensions.

## **Data and Manuals**

- a) Total weight of individual equipment if not specifically asked for in the equipment data sheet.
- b) Performance/characteristic curves for various equipment as applicable.
- c) Descriptive and illustrative literatures on the equipment offered furnishing all relevant technical features/details of the equipment.
- d) The testing programme /procedure proposed by the Tenderer for each of the applicable equipment including both shop and site tests to satisfy the requisite performance of the equipment.

**Following drawings and documents necessarily of 'Final' status shall be submitted by the successful Tenderer after award of contract and during execution of the Contract as per agreed Schedule for Purchaser's Information/Records/Approval as and where felt necessary by the Consulting Engineer. After receipt of order tenderer to furnish a detailed list of drawing/documents to be submitted by them, this shall be finalized by purchaser.**

## **PART - 'A' : General Requirement**

### **Drawings :**

- Single line process, materials balance and instrumentation diagram for each system/plant covering the entire package.
- Power and other utility distribution scheme.
- Control and protection scheme.
- Layout and Detail Arrangement drawing of each system/plant showing detailed dimensions including pipe and cable and trench layout.
- Schematic drawings for drive and other auxiliary mechanisms.
- Any other drawings not specifically mentioned in this section but considered necessary by Purchaser/Consultants for proper execution of the work.
- Complete set of final 'AS BUILT' drawings after commissioning of the plant.

### **Data, Calculations and Curves etc.:**

- Power calculation for all the individual equipment considering every operational possibility applicable to that particular equipment.
- Size selection, capacity, design calculation and complete load data for every individual equipment.
- Design calculation for all power transmission system and equipment/components e.g., gear/gear box ratings indicating service factor considered, design stress considered, transmission efficiency, reduction ratio etc.
- Details of Pollution Control measures for solid, liquid, gas effluents and noise.
- Requirement of all utilities to be provided by the Purchaser stating all relevant parameters like quantity, pressure, temperatures etc.
- Performance/characteristic curves for various equipment as applicable.
- Any other data, calculation or curves not specifically mentioned but considered necessary by Purchaser/Consultants for proper execution of the work.
- Schedule of total effluents.
- Noise data

### **Manuals/Leaflets and Write-ups**

- Material test certificates
- Detail Instruction Manuals for operation, maintenance, overhaul etc. for each equipment.
- Shop test certificates as applicable
- Manuals/Leaflets, brochures etc. describing all relevant constructional and other technical features for every individual equipment.
- Detail part list showing nomenclature, part number and/or other information necessary for correct identification and ordering of spares.
- Detail list of all special tools and tackle furnished under the Contract with drawings and procedure of usage of the same.

- Erection Manuals for every applicable equipment.

#### **Other Information**

- Detail man-power requirement for plant operation
- Detail programme for training of personnel for operation and maintenance of the plant.
- Write-up on safety requirements for plant and personnel.
- Schedule of Preventive Maintenance/Lubrication.
- Equivalent Indian grades of lubricants wherever applicable.
- Bill of materials and materials of construction.
- Maintenance clearance diagrams for all equipment.

#### **PART - B: Specific Requirements**

- In addition to the requirements stipulated in PART-A above and those asked for in relevant Equipment Data Sheets in SECTION-IV the following documents shall also be furnished by the Contractor:

#### **GRINDING MILLS**

- Arrangement drawing and system description of grinding media charging system
- Details of Trunnion Bearing and girth gear lubrication scheme.
- Details of Mill speed variation system and its controllability on the grinding circuit.

#### **PUMPS (WATER & SLURRY)**

- Details of lubrication and sealing arrangement
- Details of speed variation system and its controllability on the system characteristics.

## **SUMP PUMPS**

- Principal dimensions of the sump showing pump position indicating clearances from side and back walls, minimum submergence etc.

## **Vendor List**

### **1. C.I. Valves**

- KBL, Crescent, KSB, AUDCO, Flow Check

### **2. Horizontal Centrifugal Pumps**

#### **For Water:**

- KSB Pumps Pvt. Ltd.,
- Micro finish (BDK)
- Mather & Platt
- Worthington Pumps India Limited
- Kirloskar

#### **For Slurry:**

- Akay Industries
- McNally Bharat – SALA
- Svedala (Denver)
- Wilfly
- Weir Minerals

### **3. Vertical Centrifugal Pumps**

- McNally Bharat - SALA
- Svedala
- Weir Minerals

### **4. Submersible Pump**

- KSB Pumps
- Denver Orion
- Svedala

### **5. Gear Pumps**

- Roto, Delta Corporation, Dowty

### **6. Knife edge Gate valve**

- Larox, Technigate, Orbinox, Tyco

### **7. Ball Valves**

- Micro finish, Akay Industries, KSB, Audco



8. **Butterfly Valves**

- Fouress Engineering (I) Pvt. Ltd.
- Alfa Laval Saunders (I) Ltd
- Inter Valve
- AUDCO

9. **Diaphragm Valves**

- BDK, Alfa Laval Saunders (I) Ltd

10. **Check Valves, Gate Valves, Globe Valves**

- BDK Process Control, AUDCO, Leader Engineering Works, KSB, Crescent, Flowcheck

11. **Plug Valves**

- Xomax Engg.
- DeZURIK
- AUDCO

12. **Air Release / Float Valves**

- Leader Engineering Works
- India Valves Pvt. Ltd.

14. **Pipes** (M.S.)

- TATA, SAIL, ITC, Zenith, Jindal, Maharashtra Seamless

15. **Pipe fittings**

- MS fitting, EBY Industries, Arbind Pipes & Fittings, Stewart & Lloyds, True Fab Pvt. Ltd., Teekay Tubes Pvt. Ltd.

18. **Strainers**

- Otoklin Fitters, Greaves Limited, J. N. Marshall, Multitex Engineers (Filtration Division), Venus Enterprises
21. **PVC/HDPE Pipes & Fittings**
- Polyolefins Industries Limited
  - EMCO General Plastics
  - Oriplast
22. **Geared Motors**
- Kirloskar Electric Company Limited
  - Powerbuild Pvt. Ltd.
23. **Grease Systems**
- Lincon helicon, Dropco, Lub Systems, Elgi
24. **Gear Oil Pumps**
- Delta Corporation, Mumbai, Dowty
25. **Hydraulic System**
- Hyprecision Hydraulic
  - Vickers Systems International Limited
  - Wipro Limited (Fluid Power Division)
  - Yuken India Limited
6. **Hydraulic Oil & Lubricants**
- Bharat Shell Corporation Limited
  - Indian Oil Corporation Limited
  - HPCL
27. **Couplings**

- Elecon Engineering Company Limited
  - GMB Manufacturing (P) Limited
  - Fenner (I) Limited
  - Wellman Incandescent (India ) Limited
  - SKF
  - Concord
28. **REDUCERS/ GEAR BOXES**
- Flender Macneill Gears Limited
  - Greaves Limited
  - Kirloskar Pneumatic Co. Ltd.
30. **Bearings**
- FAG Precision Bearings Limited, SKF, TIMKEN
31. **Antivibration**
- Resistoflex Pvt. Ltd.
  - Tega
33. **Rubber Liner**
- Tega
34. **Hydro Cyclone**
- Weir
  - FLSmidth
  - Hindustan Dorr Olive
37. **HDPE Liner**
- Salimar
  - TEGA
  - Garivare
39. **Rubber Lining (Pipes & Tanks)**
- Tega

**SECTION: II/2**

**SUB-SECTION: E-001**

**ELECTRIC MOTOR**

**SECTION: III/2**

**SUB SECTION: E-001**

**ELECTRIC MOTOR**

**C O N T E N T S**

<b><u>CLAUSE NO.</u></b>	<b><u>DESCRIPTION</u></b>
<b>1.00.00</b>	<b>GENERAL</b>
<b>2.00.00</b>	<b>STANDARDS</b>
<b>3.00.00</b>	<b>SERVICE CONDITIONS</b>
<b>4.00.00</b>	<b>TYPE AND RATING</b>
<b>5.00.00</b>	<b>PERFORMANCE</b>
<b>6.00.00</b>	<b>SPECIFIC REQUIREMENTS</b>
<b>7.00.00</b>	<b>ACCESSORIES</b>
<b>8.00.00</b>	<b>TESTS</b>

## SECTION II/2

### SUB-SECTION - E-001

#### ELECTRIC MOTOR

- 1.00.00** GENERAL
- 1.01.00 Motors shall be furnished in accordance with both this general specification and the accompanying driven equipment specification.
- 1.02.00 In case of any discrepancy, the driven equipment specification shall govern.
- 2.00.00** STANDARDS
- 2.01.00 All motors shall conform to the latest applicable IS and IEC Standards/Publications except when otherwise stated herein or in the driven equipment specification.
- 2.02.00 Major standards which shall be followed are IS-325 and IEC-34. Other applicable Indian Standards for any component part shall also be followed.
- 3.00.00** SERVICE CONDITIONS
- 3.01.00 The motors will be installed in hot, humid and tropical atmosphere, highly polluted and corrosive.
- 3.02.00 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in specification E-0100.
- 3.03.00 For motor installed outdoor and exposed to direct sun rays, the effect of solar heat shall be considered in the determination of the design ambient temperature.
- 4.00.00** TYPE AND RATING
- 4.01.00 A.C. Motors**
- 4.01.01 Motors shall be general purpose, constant speed, squirrel cage, three/single phase, induction type.
- 4.01.02 All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity.
- 4.01.03 The motor name-plate rating at 50°C shall have at least 15% margin over the input power requirement of the driven equipment at rated duty point unless stated otherwise in driven equipment specification or in general electrical specification.
- 4.01.04 The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service.

5.00.00	<b>PERFORMANCE</b>
5.01.00	Running Requirements
5.01.01	Motor shall run continuously at rated output over the entire range of voltage and frequency variations of the power supply system.
5.01.02	The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.
5.02.00	Starting Requirements
5.02.01	Motor shall be designed for direct on line starting at full voltage. Starting current shall not exceed 6 times full load current for all auxiliaries. Starting torque requirement permitting, star-delta starting may be used for drives where starting current otherwise is high.
5.02.02	The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage.
5.02.03	Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals.
5.02.04	a) The motor shall be capable of three equally spaced starts in an hour,  the motor initially being at a temperature not exceeding the rated load operating temperature.
	b) The motor shall be capable of two starts in succession with coasting to rest between starts and the motor initially at rated operating temperature.
5.02.05	<b>Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with non-energized shaft rotating at 125% rated speed in reverse direction.</b>
5.03.00	Locked Rotor Withstand Time
5.03.01	<b>The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 seconds for motors upto 20 seconds starting time and by 5 seconds for motor with more than 20 seconds starting time.</b>
5.03.02	Starting time mentioned above is at minimum permissible voltage of 80% rated voltage.
5.03.03	<b>Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilising motor rated capacity.</b>
6.00.00	<b>SPECIFIC REQUIREMENTS</b>

- 6.01.00** Unless otherwise required by the process equipment, the motor shall be self ventilated type, either totally enclosed fan cooled (TEFC) or closed air circuit air cooled (CACA).
- 6.02.00** For hazardous area, approved type of increased safety enclosure shall be furnished.
- 6.03.00** **Winding and Insulation**
- 6.03.01** **All insulated winding shall be of copper.**
- 6.03.02 6600 V motors shall have class F insulation but limited to class B temperature rise. The winding shall withstand 1.2/50 microsecond switching surges of  $4U + 5 \text{ kV}$  ( $U = \text{Line voltage}$ ). The coil inter-twin insulation shall be suitable for 0.3/3 microsecond surge of 20kV for 6.6 kV system, followed by 1 min. power frequency high voltage test of appropriate voltage on turn to turn insulation.
- 6.03.03 LT motors shall have class B insulation.
- 6.03.04 Windings shall be impregnated to make them non-hygroscopic and oil resistant.
- 6.04.00 **Tropical Protection**
- 6.04.01 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.
- 6.04.02 All fittings and hardware shall be corrosion resistant.
- 6.05.00 **Noise & Vibration**
- 6.05.01 The noise level shall be limited within the values prescribed in IS:12065.
- 6.05.02 The peak amplitude of the vibration shall be within limits specified in IS:12075.
- 6.06.00 **Motor Terminal Box**
- 6.06.01 Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base- plate/ foundation
- 6.06.02 Terminal box shall be capable of being turned 360 Deg. in steps of 90°, unless otherwise approved.
- 6.06.03 The terminal box shall be split type with removable cover with access to connections and shall have the same degree of protection as motor.
- 6.06.04 The terminal box shall have sufficient space inside for termination/connection of XLPE (6.6 kV)/PVC (415V) insulated armoured aluminium cables.
- 6.06.05 Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame.
- 6.06.06 The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.



- 6.06.07 The terminal box shall be capable of withstanding maximum system fault current for a duration of 0.25 sec.
- 6.06.08 For 6600V motor, the terminal box shall be phase segregated type unless Elastimould termination with protective covers are provided. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection.
- 6.06.09 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match Owner's cable, where the cables are not in the scope of the vendor.
- 6.06.10 The gland plate for single core cable shall be non-magnetic type.
- 6.07.00 Grounding
- 6.07.01 The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer.
- 6.07.02 The cable terminal box shall have a separate grounding pad.
- 6.08.00 **Rating Plate**

In addition to the minimum information required by IS, the following information shall be shown on motor rating plate :

- a) Temperature rise in °C under rated condition and method of measurement.
- b) Degree of protection.
- c) Bearing identification no., recommended lubricant and running hours between lubrication fill up.
- d) Location of insulated bearings.

## 7.00.00 **ACCESSORIES**

### 7.01.00 General

Accessories shall be furnished, as listed below, or if otherwise required by driven equipment specification or application.

### 7.02.00 Space Heater

7.02.01 Motor of rating as specified in General Electrical Specification, shall be provided with space heaters, suitably located for easy removal or replacement.

7.02.02 The space heater shall be rated 240 V, 1 phase 50 Hz and sized to maintain the motor internal temperature above dew point when the motor is idle.

7.02.03 For motor without space heater, the motor winding shall be suitable for continuous heating from 24V, 1 phase 50 Hz supply.

### 7.03.00 **Temperature Detector**

- 7.03.01 All 6600V motors shall be provided with six (6) winding temperature detectors, two (2) per phase.
- 7.03.02 6600V motor bearing shall be provided with duplex type temperature detectors.
- 7.03.03 The temperature detector mentioned above shall be resistance type, 3 wire, platinum wound, 100 Ohms at 0 °C.
- 7.04.00 **Indicator/Switch**
- 7.04.01 Dial type local indicator with alarm contacts shall be provided for the following :
- a) 6600 V motor bearing temperature.
  - b) Hot and cold air temperature of the closed air circuit for CACA and CACW motor.
- 7.05.00 **Accessory Terminal Box**
- 7.05.01 All accessory equipment such as space heater, temperature detector, current transformers etc., shall be wired to and terminated in terminal boxes, separate from and independent of motor (power) terminal box.
- 7.06.00 Painting
- Motor including fan shall be painted with corrosion proof paints.
- 8.00.00 **TESTS**
- 8.01.00 Upon completion, each motor shall be subject to standard routine tests as per I S. In addition, any special test called for in the driven equipment specification shall be performed.

**SECTION : II/2**

**SUB-SECTION : E-002**

**MCC, ACDB, DCDB AND**

**PUSHBUTTON STATION**

## **C O N T E N T S**

### **CLAUSE NO.**

### **DESCRIPTION**

**1.00.00**

**CODES AND STANDARDS**

**2.00.00**

**SERVICE CONDITIONS**

**3.00.00**

**DESIGN CRITERIA**

**4.00.00**

**SPECIFIC REQUIREMENTS**

**5.00.00**

**TEST**

## **ATTACHMENTS**

**ANNEXURE-A**

**PROTECTIONS**

**ANNEXURE-B**

**COMPONENT/MODULE    SELECTION    TABLE**

## **SECTION : III/2**

### **SUB SECTION : E-0002**

#### **MCC, VVFD,PANEL, ACDB, DCDB, DCDB AND**

#### **PUSH BUTTON STATION**

- 1.00.00 CODES AND STANDARDS
  - 1.01.00 Major standards which shall be followed are IS : 13947 and IEC : 947. Other applicable standards for any component, if not covered in the listed standards, shall also be followed.
- 2.00.00 SERVICE CONDITIONS
  - 2.01.00 The equipment shall be suitable for hot, humid, and tropical atmosphere, heavily polluted with dust and corrosive chemical fumes.
- 3.00.00 DESIGN CRITERIA
  - 3.01.00 Busbars of MCCs/DBs shall be sized to carry continuously the total running load of the MCC/DB (including customer's load, wherever applicable) plus a 20% margin.  
  
All busbars shall be capable of withstanding the mechanical forces and thermal stresses due to maximum short circuit current.
  - 3.02.00 In-cubicle ratings of incomer and bus-section breakers/switches shall be identical to the associated busbar rating.
  - 3.03.00 All incomers rated upto and including 630 A shall be switch controlled. Above 630 A, all incomers shall be breaker controlled. Incomer rated 630A shall be breaker controlled in case the MCC has one or more breaker controlled drives.
  - 3.04.00 All motors rated above 110 KW shall be breaker controlled.
  - 3.05.00 Motors rated upto and including 110 KW shall be contactor operated.
  - 3.06.00 For continuous operation at specified ratings, the temperature rise of various equipment/components shall be limited to the permissible values specified in relevant standards and/or this specification.
  - 3.07.00 Circuit breakers shall not produce any harmful overvoltage during switching off of induction motors. If required, surge protective devices shall be included in the scope of supply to limit over voltages.
- 4.00.00 SPECIFIC REQUIREMENTS
  - 4.01.00 Construction

- 4.01.01 MCCs/DBs shall be indoor, air insulated, and metal-clad type.
- The design construction shall be such as to permit extension at either end.
- 4.01.02 MCCs shall be non-drawout (fixed) type except the breaker portion which shall be drawout type. DBs shall be fixed type.
- 4.01.03 MCCs/DBS shall be suitable for floor-mounting.
- 4.01.04 MCCs in general shall be of single-front construction unless Owner approves double front construction at execution stage due to Owner's space limitation in specific areas.
- 4.01.05 MCC/DB assemblies shall comprise of a continuous line-up of dead-front, free-standing vertical sections, housing the control modules in multi-tier formation. For MCCs having breaker the installation of circuit breakers shall however be limited to the bottom two tiers only. Not more than two breakers shall be accommodated in one vertical section.
- All MCCs/DBs shall be front-wired and front-connected.
- 4.01.06 MCCs/DBs shall be fully compartmentalised with metal/insulating partitions between compartments.
- Working height shall be limited between 450mm and 1800mm from floor level.
- 4.01.07 Each breaker/control module shall be housed in a separate cubicle, complete with an individual front access door having sufficient opening with concealed type hinges.
- Each vertical section shall have a removable back cover. All doors and covers shall be gasketed.
- 4.01.08 Breaker cubicles shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position.
- 4.01.09 For breaker panels, all switches, lamps, and indicating instruments shall be flush mounted on the respective compartment door whereas relays and other auxiliary devices shall be mounted in a separate compartment.
- For MCC/DB modules, all push-buttons, lamps and indicating instruments shall be flush/semi-flush mounted on respective module compartment.
- 4.01.10 For single-front assemblies, a full-height vertical cable alley with cable supports shall be provided in each section to facilitate unit wiring.
- The alley shall be liberally sized to accommodate all cables and shall have removable cover at the front for access.
- For double-front assemblies, two full-height vertical cable alley with cable supports shall be provided in each section, one on either front, to facilitate unit wiring. These chambers shall be liberally sized to accommodate all cables and shall have removable front cover for access.
- 4.01.11 Wherever two breaker compartments are provided in the same vertical section, insulating barriers and shrouds shall be provided in the rear cable compartment to avoid accidental touch with the live parts of one circuit while working on the other.

- 4.01.12 A horizontal wireway extending the entire length of the assembly shall be provided of the top for inter-panel wiring.
- 4.01.13 MCCs/DBs shall be supplied with base frames made out of structural steel sections.
- 4.01.14 After isolation of power and control circuit connections, it shall be possible to safely carry out maintenance in a compartment with the busbar and adjacent circuit live. Necessary shrouding arrangement shall be provided for this purpose over the cable terminations located in cable alley.
- 4.01.15 The minimum clearance in air between phases and between phases and earth for the entire run of horizontal and vertical busbars shall be 25mm. For all other components, the clearance between two live parts, a live part and an earthed part, and isolating distance shall be at least 10mm throughout. Wherever it is not possible to maintain these clearances, insulation shall be provided by barriers. However, for horizontal and vertical busbars, the clearances mentioned above should be maintained even when these are sleeved or insulated. All connections from busbars upto fuses shall be fully shrouded to minimize the risk of phase to phase and phase to earth shorts.
- 4.01.16 Unless otherwise stated, equipment rating shall be as per Annexure - B.
- 4.02.00 Bus and Bus Taps
- 4.02.01 All MCCs/ACDBs shall be provided with three phase busbars and neutral busbar.  
  
All DCDBs shall be provided with two busbars.  
  
All busbar compartments shall be completely enclosed.
- 4.02.02 Horizontal and vertical busbars and bus connections shall be of high conductivity copper.  
  
The maximum temperature of busbars and bus connections shall be limited to 90°C i.e 40°C rise over 50°C ambient.  
  
No diversity factor shall be allowed for temperature rise.
- 4.02.03 Vertical busbars shall be designed for a minimum current rating of 200 A.
- 4.02.04 All bus connections shall be provided with anti-oxide grease. Adequate contact pressure shall be ensured by means of two-bolt connection with plain and spring washers and locknuts. Jointing area of busbar shall be tinned . all the bus bars shall be insulated with heat shrink type sleeve with colour code.
- 4.02.05 Bimetallic connectors shall be provided for connections between dissimilar metals.
- 4.02.06 Cross-section of the busbars shall be uniform throughout the length of the assembly. All busbars and bus connections shall be supported and braced to withstand the stresses due to maximum short circuit current and also to take care of any thermal expansion.

- 4.03.00 MCC/DB Modules
- 4.03.01 MCC modules shall have self-aligning power/control disconnects. All disconnects shall be silver plated to ensure good contacts. This feature and any other feature described below but which is exclusively for draw-out design are not to be considered where non-drawout (fixed) type MCC is specified.
- 4.03.02 Modules of same size and type shall be physically and electrically interchangeable.
- 4.03.03 The design of drawout modules shall be such as to permit easy withdrawal/re-insertion of the unit with guiderails to ensure correct alignment.
- 4.03.04 Various module sizes should be multiples of one basic unit to facilitate modifications at site. Suitable provision for this purpose should also be incorporated in the vertical busbars.
- 4.03.05 Drawout modules where specified shall have three distinct positions, namely, SERVICE, TEST and ISOLATED
- In the SERVICE position, both power and control circuits shall be engaged. It shall not be possible to open the module door when the module is in SERVICE position.
- In the TEST position the power circuits shall be disengaged but the control circuits shall be engaged. It shall be possible to close the module door when the module is in TEST position. Racking in of the module from TEST to SERVICE position shall not be possible unless the module door is closed.
- In the ISOLATED position, both power and control circuits shall be disengaged.
- 4.03.06 Modules shall house the control components for a circuit such as switch, fuse, contactors, relays, push-buttons, lamps, meters, etc. only the push-button actuators, lens' of indicating lamps, and transparent windows for meters shall be mounted on module door such that when the module is withdrawn, the cubicle door shall provide specified degree of protection when the module door is closed.
- 4.03.07 Breaker operated incomers and bus sections shall be provided with one(1) TEST-NORMAL-SWGR selector switch. Breaker operated motor feeders shall be provided with TEST-NORMAL-TRIAL selector switch.
- Contactor operated motor feeder modules shall be provide with one(1) MCC-NORMAL-TRIAL selector switch.
- These selector switches shall be lockable type and shall be mounted inside the panel.
- 4.03.08 The equipment layout shall provide sufficient working space in between the components.
- 4.04.00 Circuit Breaker



- 4.04.01 Circuit Breakers shall be draw out type, three pole, single throw, air break type with stored energy, trip free mechanism and shunt trip coil. It shall be suitable for a duty cycle of O - 3 min - CO – 3 min - CO.
- 4.04.02 All incomer breakers and motor feeder breakers shall have motor-wound spring charging mechanism.
- 4.04.03 Each breaker operated feeder shall be provided with protective devices as specified in Annexure-A.
- 4.04.04 All breakers with motor wound spring charging mechanism shall have facility of manual spring charging also.
- 4.04.05 For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open- close-open operation of the circuit breaker shall be possible after failure of power supply to the motor.
- 4.04.06 Mechanical safety interlock shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.
- 4.04.07 Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.
- 4.04.08 Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operation counter, mechanism charge/discharge indicator, and electrical anti-pumping feature.
- 4.04.09 In addition to the auxiliary contacts required for normal breaker operation and indication, each breaker shall be provided with the following for interlocking purpose :
- a) Position/cell switch with minimum 4 NO + 4 NC contacts.
  - b) Auxiliary switch, with minimum 6 NO + 6 NC contacts, mounted on the stationary portion of the breaker panel and operated mechanically by a sliding lever from the breaker in SERVICE position.
- Alternatively, electrically reset latching relay may be used for the purpose. The exact requirement contacts of the position/cells switch, limit switch, auxiliary switch and latching relay shall be decided by the Tenderer taking into account the scheme requirement and spares. Limit/auxiliary switches shall be convertible type, that is, suitable for changing N.O. contact to N.C. and vice-versa.
- 4.04.10 Spring charge limit switch shall be provided for breakers with motor wound spring charging mechanism. These limit switches shall be provided with minimum 2NO + 2NC contact.
- 4.04.11 Limit/auxiliary switches shall be convertible type, that is, suitable for changing N.O. contact to N.C. and vice-versa.
- 4.05.00 Switches
- 4.05.01 Switch handle shall have provision for padlocking in ON and OFF position.

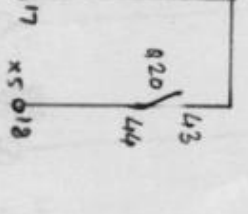
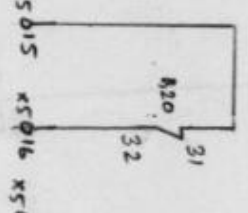
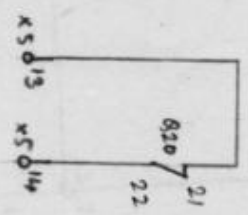
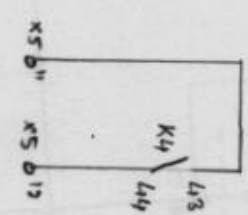
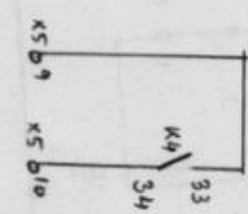
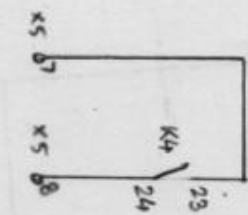
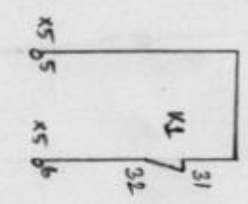
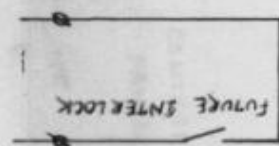
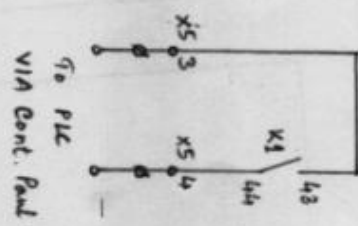
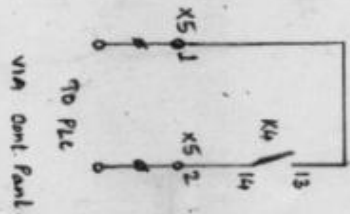
- 4.05.02 The compartment door shall be interlocked mechanically with the switch such that the door cannot be opened unless the switch is in OFF position. Means shall be provided for releasing this interlock at any time.
- 4.06.00 Fuses
- 4.06.01 Fuses shall be HRC type with operation indicator.
- 4.07.00 A.C. Starter
- 4.07.01 Contactors
- a) Motor starter contractors shall be of air break, electromagnetic type as per IS:13947 Part-4, Section-1 suitable for DOL starting of motor and shall be of utilization category AC-3 for ordinary and AC-4 for reversing starters.
  - b) Contactor starters shall comply with the requirements of 8544 (Part-1) in respect of co-ordination of the characteristics of contactor, overload relay, and fuse. The type of co-ordination shall be Type-2 as per IS-8544.
- 4.07.02 Thermal Overload
- a) Thermal over load relays shall be individual mounting type (Not contactor mounting type). Thermal overload relays shall be manual reset type and ambient temperature compensated with adjustable settings.
  - b) Single phasing preventor shall be provided as an inbuilt feature of the thermal overload relay.
- 4.08.00 Control and Indication
- 4.08.01 The general scheme of connections for control, interlock, and protection is shown in the enclosed drawings. Detailed requirements of individual circuits shall be developed by the Tenderer.
- 4.08.02 All indicating lamps shall be of high intensity cluster LED type.
- 4.08.03 For control supply, 2x100% adequately-rated 415/240V control transformers with provision of momentary paralleling during change-over and with necessary taps shall be provided. Auxiliary bus bars shall be used to distribute 240V AC control supply. The control supply of different modules shall be tapped individually from the auxiliary bus bars. Transformer ratings shall have adequate spare capacity.
- 4.09.00 Meter and Meter Selector Switch
- 4.09.01 All indicating instruments (96 x 96 mm) shall be flush-mounted on front panel with 250 Deg. scale, anti-glare glass and accuracy class of + 2% full scale. Each meter shall have zero adjuster on the front.
- 4.09.02 Motor ammeters shall have an extended suppressed end-scale range to indicate starting current (6 to 8 times full-load current).
- 4.09.03 Watt-hour meters shall be provided in drawout cases. Either built-in test facilities or test blocks shall be provided to facilitate testing of meters without disturbing C.T and V.T secondary connections.

- 4.09.04 All motors of 30 kW and above shall have an ammeter in addition to remote metering facility through current transducers.
- 4.10.00 Current and Voltage Transformer
- 4.10.01 All current and Voltage Transformers as required for metering and specified protection shall be completely encapsulated, cast resin insulated type. The accuracy class shall be as below :
- |            | CT          | VT  |
|------------|-------------|-----|
| Protection | 5P20        | 3P  |
| Metering   | 1.0 (ISF<5) | 1.0 |
- 4.10.02 Feeders requiring remote metering and/or current monitoring shall be provided with current transducers with calibration for full scale reading.
- 4.11.00 Relays
- 4.11.01 Relays shall be of drawout design with built-in testing facilities. Small auxiliary relays may be in non-drawout execution.
- 4.11.02 All protective relays, auxiliary relays, and timers shall be provided with hand reset operation indicator (flag) or LEDs with pushbutton for resetting.
- 4.12.00 Secondary Wiring
- 4.12.01 Wiring shall be done with flexible, 650V grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 mm<sup>2</sup> for control & current circuits and 1.5 mm<sup>2</sup> for voltage circuits.
- 4.13.00 Terminal Blocks
- 4.13.01 Terminal blocks shall be 660V grade box-clamp type with marking strips, similar to ELMEX 10 mm<sup>2</sup> or equal. Terminals for C.T. secondary leads shall have provision for shorting. Terminals blocks used for interface with DCS via termination cabinet shall be suitably sized to facilitate proper termination of interconnecting cables.
- 4.14.00 Cable Termination
- 4.14.01 Generally, all assemblies shall be designed for cable entry from the bottom.
- 4.14.02 Gland plates shall be minimum 4 mm thick. The gland plate and supporting arrangement for 1/C power cables shall be of non-magnetic material.
- 4.15.00 Ground Bus
- 4.15.01 A ground bus, rated to carry maximum fault current, shall be provided which shall extend the full length of the assembly.
- 4.15.02 All stationary units shall be directly connected to the ground bus for effective grounding. The frames of all circuit breakers and drawout V.T. modules (if any) shall be grounded through heavy multiple contacts at all

- times except when the primary disconnecting devices are separated by a safe distance.
- 4.15.03 All hinged doors shall be earthed by flexible copper braid.
- 4.16.00 Nameplates
- 4.16.01 Nameplates of approved design shall be provided on each cubicle, at the top of the assembly and on each instrument & device mounted on or inside the cubicle.
- 4.17.00 Space Heaters and Plug Sockets
- 4.17.01 Each vertical section shall be provided with thermostat controlled space heater and 5A, 3 pin plug socket.
- 4.17.02 In addition, feeders for motors with space heater shall be wired-up for feeding the motor space heater through suitably rated breaker auxiliary NC contact and/or contactor.
- 4.18.00 A.C./D.C. Power Supplies
- 4.18.01 Necessary AC and DC power supplies as required for control and service, shall be arranged by the contractor.
- 4.19.00 Tropical Protection
- 4.18.01 All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus & insects.
- 4.18.02 In view the plant consists of extensive material handling and chemical processing, special anti-corrosion measures in painting shall be taken as necessary.
- 4.19.00 General
- 4.19.01 Nameplates :Nameplates of approved design shall be provided on each Cubicle,at the top of the assembly and on each instrument & device mounted on or inside the cubicle.
- 4.19.02 All motor feeders other equipments shall be provided with Current Transducers (Dual channel) of output 4-20 mA for remote metering
- 4.19.03 All motor feeders shall have a test push button inside the feeder for testing the healthiness of the control circuit when the main SFU is in OFF position. This has been also reflected in our attached control circuit of DOL starter indicated below.
- 4.19.04 Local Push Button Stations (LPBS) shall be supplied with the MCC Panel for each and every motor & SFU feeders. The LPBS shall be double door type with canopy at the top and shall be of 290 mm X 290 mm X 250 mm (H X W X D). The LPBS shall have 1 no. Start push button and 1 no. Emergency Stop push button (Mushroom head type).
- 4.19.03 The color of the MCC panel shall be smoke grey



... AID UNIT FOR DOL STARTING



5.00.00 TEST

5.01.00 The switchgear shall be completely assembled, wired, adjusted and tested at the factory as per the relevant standards.

5.02.00 Routine Tests shall be carried out as per relevant standards.

5.03.00 Type Tests shall be carried out as per specification E-0100.

## PROTECTION

All equipment shall have necessary protections. However, following minimum protections shall be provided :

- A. Motor feeders : Motors of rating below 160 KW
- i) Instantaneous short circuit protection on all three phases.  
For contractor starters, it shall be through HRC cartridge type fuses rated for 80 kA rms.
  - ii) Thermal overload protection
  - iii) Unbalance (negative sequence) protection
  - iv) Locked motor protection
  - v) Earth fault protection
- B. HT Motor feeders : HT motor feeder (HT circuit breaker ) shall be in purchasers scope but all inter connections for protection and starting of the motor including supply of cables, glands etc shall be in the scope of bidder.

- NOTE :
- 1. For contactor starter, the protection mentioned against serial no. (iii) will be replaced by single phasing protection which may be built-in with thermal overload relay.
  - 2. Protection mentioned against Serial Nos. A(iii) to A (v) are not applicable for contactor starter.
  - 3. Protection mentioned against Serial Nos. A (i) to A (v) shall be provided in a composite motor protection relay (99) for ACB operated drives.
  - 4. Apart from protection relays mentioned above, electrically operated breakers shall be provided with anti pumping (94), trip annunciation (3), lockout (86) and trip circuit suppression (74) relays. Lockout relay shall be hand-reset type.



## COMPONENT/MODULE SELECTION TABLE

## NOTE:

1. \* Fuse and thermal overload relay are to be co-ordinated with motor rating by the Contractor.
2. "U" stands for Unidirectional and "R" for Reversible drives.
3. Cable sizes are indicative. Sizes shall be subject to validation by design calculation as per stipulation of Specification.

## MOTOR FEEDER

TYPE	MOTOR RATING (kW)	SWITCH RATING	FUSE RATING	CONTACTOR	CABLE SIZE (SQ.MM.) for motor connection	Copper flexible cable size for power circuit of motor feeders	MODULE SIZE (MIN.) (In mm)
AU/AR	0 – 5.5	32A	*	32A	3C-2.5 – CU or 3C-6 - CU	2.5 for 3.7 KW and 4 sq.mm for 5.5 kw	400
BU	5.6 – 11	63A	*	63A	3C-10/16 - AL	6 sq.mm	600
CU	11.1 – 22	100A	*	125A	3C-25/35 - AL	10 sq.mm.	600
DU	22.1 – 45	200A	*	160A	3C-50/70 - AL	25 sq.mm	900
EU	45.1 – 55	250A	*	200A	3C-95/120 - AL	35 sq.mm	900
FU	55.1 - 75	250A	*	250A	3C-150-AL	Copper bus bar of suitable size	900
GU	75.1 – 110	400A	*	300A	2x3C-240 AL	Copper bus bar of suitable size	1200

## OUTGOING FEEDER – AC

TYPE	SWITCH RATING	FUSE RATING	Copper flexible cable size for power circuit outgoing feeders	CABLE size from going to equipment	MODULE SIZE (Min.) (In mm)
AF	63A	32A	6 sq.mm	4C-16-AL	300
BF	63A	63A	16 sq.mm	4C-35-AL	300
CF	100A	100A	25 sq.mm	3.5C-95-AL	600
DF	200A	200A	70 sq.mm. of copper busbar of suitable size	3.5C-300-AL	600
EF	400A	400A	Copper bus bar of suitable size	4x1C-630-AL or 2x3.5C-300-AL	900
FF	630A	630A	Copper bus bar of suitable size	7x1C-630-AL or 3x3.5C-300-AL	900

#### OUTGOING FEEDER – DC

TYPE	SWITCH RATING	FUSE RATING	CABLE SIZE (min)
DAU	16A	16A	2/C-2.5 Sq.mm. cu.
DAF	32A	32A	2/C-2.5 Sq.mm. cu.
DBF	63A	63A	2 x 2/C-16 Sq.mm - Al
DCF	100A	100A	4/C-35 Sq.mm - Al
DDF	200A	200A	2 x 4/C-35 Sq.mm - Al

**SECTION : III / 2**

**SUB SECTION : E-003**

**CABLES**

**SECTION : III/ 2**  
**SUB-SECTION : E-003**

**C A B L E S**

<b><u>CLAUSE NO.</u></b>	<b><u>DESCRIPTION</u></b>
<b>1.00.00</b>	<b>CODES AND STANDARDS</b>
<b>2.00.00</b>	<b>SERVICE CONDITIONS</b>
<b>3.00.00</b>	<b>DESIGN CRITERIA</b>
<b>4.00.00</b>	<b>SPECIFIC REQUIREMENTS</b>
<b>5.00.00</b>	<b>TESTS</b>

ATTACHMENT

SECTION : III / 2

SUB SECTION : E-003

C A B L E S

**1.00.00** CODES AND STANDARDS

Major standards which are to be followed are IS : 1554 , IS : 6380 , IS : 7098 , IS : 9918 and IEC : 502

**2.00.00**

All cables shall be suitable for a hot, humid and tropical atmosphere with dust and corrosive chemical fumes. All cables shall be designed to withstand the mechanical, electrical and thermal stresses under the steady state and transient / fault conditions, and shall be suitable for the proposed method of installation.

**3.00.00** DESIGN CRITERIA

3.01.00 For continuous operation at specified rating, maximum conductor temperature shall be limited to the permissible value as per relevant standard and / or this specification.

**3.02.00 Armouring shall be single round wire of galvanised steel for multicore cables and aluminium for single core cable.**

**3.03.00 Core identification for multicore cable shall be provided by colour coding.**

**4.00.00** SPECIFIC REQUIREMENTS

**4.01.00** General Description

All cables shall be furnished in strict compliance with ratings and requirements and sizes as given in Annexure to this Specification.

- 4.02.00** Selection Criteria
- 4.02.01** In cable sizing the following are to be taken into consideration
- a) **Short circuit current and duration**
  - b) **Continuous current**
  - c) **Installation conditions**
  - d) **Voltage drop under normal running and starting condition.**
- 4.02.02** Apart from above, consideration shall also be given to limit the cable to some standard sizes of using too many types.
- 4.02.03** The standard cable sizes ampere capacities and derating factors as given in IS will be generally followed.
- 4.02.04**
- a) For breaker protected circuits minimum size will be determined by short circuit rating. For the purpose of calculating the minimum cable size, the following fault levels and duration shall be considered.
 

6600 V System - 24.0 KA, 0.2 second

415 V System - 37.75 KA, 0.2 second
  - b) For motor circuits the selection of size will be made ensuring that the cable shall withstand a short circuit fault directly following a second hot start.
- 4.02.05** For fuse protected circuit the conductor size will depend on full load current subject to voltage drop not exceeding 3% under full load conditions and 10% during motor starting conditions. For practical purposes, the minimum size shall be 6 Sq.mm for aluminium and 2.5 Sq.mm. for copper.
- 4.02.06** All control cables shall be of 2.5 Sq.mm copper.
- 4.02.07** Multi core control cables will generally have spare conductor(s) in accordance with the following chart :

<b>Conductors required</b>	<b>Cables</b>
	1 or 2 1-3 / C
	3 or 4 1 - 5 / C
	5 or 6 1 - 7 / C
	7 or 8 1 - 10 / C
	9, 10, 11 or 12 1 - 14 / C

13, 14, 15 or 16      1 - 19 / C  
above 16      Two or more of above

cables

4.02.08      Separate cables for each type of following services / functions as applicable shall be used for each feeder. Same multicore cable using different services shall not be acceptable.

- a)      Power
- b)      Control, interlock and indication
- c)      Metering and measuring
- d)      Alarm and annunciation
- e)      C T Cables
- f)      P T Cables

4.02.09      Separate cables shall be used for AC and DC circuits.

4.03.00      **Cable Identification**

Cable identification shall be provided by embossing on the outer sheath the following :

- a)      Manufacturers name or trademark
- b)      Voltage grade
- c)      Year of manufacture
- d)      Type of insulation e.g. HR85 for HR PVC  
etc.
- e)      Type of outer sheath e.g. "FRLS" etc.
- f)      ISI marks
- g)      Nominal cross sectional area of the  
conductor & no. of cores

5.00.00      **TESTS**

5.01.00      **Shop Tests**

The Cables shall be subject to shop tests in accordance with relevant standards to prove the design and general qualities of the Cables as below :

5.01.01      Routine tests on each drum of cables.

5.01.02      Acceptance tests on drums chosen at random for acceptance of the lot.

- 5.01.03 Type tests on each type of cable, inclusive of measurement of amount D.C. resistance of power cables.
- 5.01.04 For instrumentation cable, in addition to above, the insulation resistance test and High Voltage test at 2 KV shall be conducted.



RATINGS AND REQUIREMENTS  
(POWER AND CONTROL CABLES)

**HV POWER CABLES (6600 / 6600V GRADE)**

- 1.0 6600 / 6600V grade 90° C rating heavy duty XLPE power cable suitable for use in 6600V non-effectively earthed system conforming to following requirement and in line with IS – 7098. IS 8130 & IS 5831 and IS 3975.
- 1.1 Conductor Stranded and compacted aluminium conductor of grade H2 and Class 2 for all sizes, generally conforming to IS:8130.
- 1.2 Conductor Screen Extruded semi-conducting compound.
- 1.3 Insulation Extruded cross-linked polyethylene (XLPE)
- 1.4 Insulation Screen Extruded semi-conducting compound with a layer of non-magnetic metallic tape. For single core armoured cables, the armouring shall constitute the metallic part of screening. The semi-conducting tape shall be easily strippable.
- 1.5 Core Identification By coloured strips applied on (For three core cables) cores or by numerals.
- 1.6 Inner Sheath Extruded PVC compound conforming to type ST2 of IS:5831 for three core cables. Single core cables shall have no inner sheath.
- 1.7 Armour Galvanised single round steel wire armour for twin and multicore cables. Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables.
- 1.8 Overall Sheath Extruded PVC compound conforming to type ST2 of IS 5831.

## **L. V. POWER CABLES**

- 1.0 1100 V grade, 85° C rating, heavy duty, HR (Heat Resistant) PVC power cable conforming to following requirement and in line with IS-1554, IS-5831 & IS-8130, IS-3975.
- 1.1 Conductor Stranded and compacted plain aluminium of grade H2 and class 2/stranded, high conductivity annealed plain copper as per Annexure generally conforming to IS:8130.
- 1.2 Insulation Extruded HR PVC compound conforming to type C of IS:5831.
- 1.3 Inner Sheath Extruded PVC compound conforming to type ST2 of IS:5831 for multicore cable. Single core cables shall have no inner sheath.
- 1.4 Armour Galvanising single round steel wire armour for twin and multicore cables. Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables.
- 1.5 Overall Sheath Extruded PVC compound conforming to type ST2 of IS:5831.

## **CONTROL CABLES**

- 1.0 1100 V grade 70° C rating PVC Control cable conforming to following requirement and in line with IS:1554, IS:8130, IS:5831 and IS:3975.
- 1.1 Conductor Stranded non-compacted and circular, high conductivity annealed plain copper, generally conforming to IS:8130.
- 1.2 Insulation Extruded PVC compound conforming to type A of IS : 5831.
- 1.3 Inner Sheath Extruded PVC compound conforming to type ST1 of IS:5831 for multicore cables. Single core cables shall have no inner sheath.
- 1.4 Armour Galvanised single round steel wire for twin and multicore cables.
- 1.5 Overall Sheath Extruded PVC compound conforming to type ST1 of IS : 5831.

**SECTION : III/2**

**SUB-SECTION : E-004**

**ROTOR STARTER**

**SECTION : III/2**

**SUB-SECTION : E-004**

**ROTOR STARTERS**

**C O N T E N T S**

**CLAU S E D E S C R I P T I O N**

**1.00.00**

**DESIGN CRITERIA**

**2.00.00**

**SPECIFIC REQUIREMENTS**

## **SECTION : III/2**

### **SUB-SECTION : E-004**

#### **ROTOR STARTER**

##### **1.00.00 DESIGN CRITERIA**

- 1.01.00 Poly-phase air cooled grid resistance rotor starters shall be provided for all 6.6 kV slip-ring motors with rating below 750 KW. For slip ring motors with rating from and above 750 kW liquid rotor starters shall be provided.
- 1.02.00 The rotor starter shall be so designed that it shall conform in all respects to the duty, starting torque and time, rotor voltage, rotor current, number of starts etc. of the motor to which it is connected.
- 1.03.00 All starters shall be installed as near their respective drives as possible.

##### **2.00.00 SPECIFIC REQUIREMENTS**

###### **2.01.00 General**

- 2.01.01 All starters shall be complete with necessary control gears and accessories required for safe and trouble free operation.
- 2.01.02 Each rotor starter shall be suitable for motorised electrical operation as well as for hand wheel operated manual operation and be so interlocked as to prevent simultaneous operation with hand and electrical power. Pilot motor shall be suitable for 415V, 3 ph. ,50 Hz, supply.
- 2.01.03 Oil immersed / liquid starter shall be provided with oil / liquid level indicator complete with one set of NO and NC contacts.
- 2.01.04 All starters shall be self-standing and floor-mounted and provided with base frame of adequate size.
- 2.01.05 End position limit switches shall be provided with at least one set of spare NO and NC contacts.
- 2.01.06 From any position the starter shall be able to revert to its initial starting position, in case the main motor trips or is switched off before cutting the complete resistance and short circuiting it.
- 2.01.07 Oil immersed/air cooled grid resistance starters shall be provided with mechanical step position indicators.

- 2.01.08 Oil immersed / liquid starters shall be provided with 'high' and 'low' temperature alarm and trip contacts.
- 2.01.09 All starters shall be designed to meet the required number of starts as specified for the motor.
- 2.01.10 Starters shall be suitable for outdoor / indoor mounting as required.
- 2.01.11 Liquid resistance starters shall be provided with pumps and associated piping work, if required.
- 2.01.12 Necessary short circuiting contactors shall be provided to cut off the residual resistance in rotor circuit of the liquid filled rotor starters. The contactors shall be provided with necessary auxiliary contacts as required for interlocking purpose. One set of NO and NC contacts shall be kept as reserve. The contactor shall operate automatically depending on the actuation of end limit switches of the starter and de-energize after the rotor is short-circuited.
- 2.01.13 The panel shall be complete with all equipment, control elements and protective devices as necessary for efficient and trouble free operation of the equipment and be internally wired up.
- 2.01.14 Cable-end boxes shall be suitably located to enable easy termination of power cables allowing necessary bending radius of such cables. Cable boxes for control cable shall be separately located and provided with compression type cable glands. Cable shoes shall be provided for each power cable / control cable. All terminals shall be provided with nuts and washers of proper size. The cable end box shall be suitable for cable entry from bottom.
- 2.01.15 In case of grid resistance starters resistance element shall be made of unbreakable rustless material.
- 2.02.00 Tank (for oil immersed / liquid starters)
- 2.02.01 Tanks shall be of welded construction and fabricated from sheet steel plate of adequate thickness. All seams shall be properly welded to withstand requisite impact during short circuit without distortion. All welded joints shall be stress relieved.
- 2.02.02 The tanks shall be provided with proper lifting eye bolt for easy handling during transport and erection.
- 2.02.03 Oil liquid drain cock shall be provided with each tank.
- 2.03.00 Control boxes for rotor starters
- 2.03.01 Each starter shall be provided with the local control boxes integral to the starter housing with necessary time-delay relays, auxiliary relays,

contactors, protective devices as required for the operation, protection and signaling of the starter and the pilot motors. All these items shall be properly and neatly wired up internally to a terminal block.

2.03.02 The control box mentioned above shall have the facility to check the operation of the pilot motor from local.

2.03.03 Main drive shall be tripped with time delay under any one of the following conditions :

- a) Oil / electrolyte temperature high
- b) Oil / electrolyte level low
- c) Defect in the operation of resistance cutting mechanism.

All these contacts shall be suitably paralleled to operate a master relay in the control box of the starter from which the time delayed trip contact will be taken to the trip circuit of the respective high voltage circuit breaker of the main drive. Similarly all alarm contacts also shall be paralleled to operate a master relay in the control box from which one contact will be taken to the alarm circuit.

2.03.04 Bidder shall furnish the complete control schematic for the operation, protection and signaling of the oil immersed / liquid filled rotor starters.

2.04.00 Contactor operated Rotor Starter may be offered as an alternative to the motor operated rotor starter.

#### 2.05.00 **Grounding**

2.05.01 Provision of two separate and distinct grounding connections shall be provided in each rotor starter as well as on its terminal box.

2.05.02 The grounding pads shall include two cleaned metal surface on the frame for connection of grounding connection of 50 x 6 mm MS flat. Each grounding pad shall be provided with two tapped holes with bolts, nuts, spring and plain washers.

**SECTION: III/2**

**SUB-SECTION: E-005**

**VVVF DRIVE**



## **SECTION: III/2**

### **SUB-SECTION: E-005**

#### **VVVF DRIVES**

##### **Specification of VVVF Panels**

1. The VVVF Panels shall be suitable for 3-phase, 440 volts AC, 50 Hz., 3 wire system and fully controlled. The speed control range for frequency controlled VVVF Drives shall be 1:10.
2. The VVVF Panels shall be controlled by microprocessor based, voltage source converters and should possess the following features at minimum:
  - i) They should permit good dynamic performance and stable motor operation over the speed control range.
  - ii) Fully digital, microprocessor based.
  - iii) Simplified tuning and start-up.
  - iv) Quick fault diagnostics through plain and simple text display.
  - v) Remote control and monitoring feasibility of the drive.
  - vi) Proper provision for suppression of harmonics.
3. The VVVF Panels shall provide the following protections along with fault diagnostics:
  - i) Power Supply failure
  - ii) Defective module
  - iii) Line fault
  - iv) Over Current
  - v) Over voltage
  - vi) Under voltage
  - vii) Earth fault
  - viii) Short Circuit Fault
  - ix) Thermal Over load
  - x) Motor protections such as motor stall, negative phase seq., locked rotor etc.

##### **General Specifications:**

- 1) The VVVF panels shall consist of vertical sections, fabricated from minimum 3 mm. thick sheet steel duly treated by the seven tank process, shaped and reinforced to form a rigid free-standing, drip proof, vermin proof structure and powder painted gray with RAL 7032.
- 2) All panels will be of same depth and height. The doors shall have concealed hinges, properly gasketed and easy operating type fasteners. There shall be lifting eye-bolts at the top of the panel for lifting it properly and safely.
- 3) The bottom of the panel shall be complete with base channel frames of suitable size with anchor bolts and/or foundation bolts, nuts and leveling attachments for fixing the equipment to the floor which shall be furnished along with the panels where required.
- 4) All equipment, accessories and wiring shall be provided with tropical finish for prevention of fungus growth and the panels shall be made dust tight and the paints shall be such as to prevent corrosion and rusting.
- 5) The entry and exit of the cables shall be from the bottom of the panel and through detachable gland plate.
- 6) There should be minimum 250 mm clearance between gland plate and termination point in order to facilitate easy termination of incoming and outgoing cables.
- 7) All nuts, bolts, washers shall be cadmium plated or zinc passivated.
- 8) All equipment and accessories required for individual drives shall be segregated and housed separately in sheet steel enclosed cubicles.
- 9) The VVVF Panels shall be suitable for 3-Phase, 440 Volts AC, 50 Hz., system. The control supply shall be 230 Volts AC, 50 Hz. and shall be through a suitably rated 440/230 Volts Control Transformer.
- 10) Necessary control equipment and accessories shall be provided to achieve control, indication and metering from central control panel and local control stations in Remote mode and Panel control in Panel mode.
- 11) The VVVF Panels shall have R, Y and B phase indication lamps mounted on the door for indication of 3-phases for incoming supply. It shall also have AMBER, GREEN and RED indication lamps for indicating Drive healthy, running and fault status.
- 12) Each VVVF Panel shall be supplied with Local Control Stations(LCS). The provision of control/metering/indication in VVVF Drive Panel, LCS & control room shall be as follows:
  - I) VVVF Drive Panel
    - a) Control
      - i) Panel / Remote selector switch
      - ii) Panel start/stop
      - iii) Emergency stop
      - iv) Speed increase decrease
    - b) Metering
      - i) Multi function meter
    - c) Indication
      - i) R-Y-B indication
      - ii) Drive healthy
      - iii) Drive running
      - iv) Drive fault

- II) Control Room
  - a) Control
    - i) Local & PLC selection SW
    - ii) PLC start/stop
    - iii) Speed reference from PLC
  - b) Metering
    - i) Motor current
    - ii) Motor Speed
  - c) Indication
    - i) Drive healthy
    - ii) Drive running
    - iii) Drive fault
- III) Local Control Stations
  - a) Control
    - i) Drive start/stop
    - ii) Emergency stop
    - iii) Speed increase/decrease
  - b) Metering
    - i) Motor current
    - ii) Motor speed
  - c) Indication
    - i) R-Y-B Indication
    - ii) Drive healthy
    - iii) Drive running
    - iv) Drive fault

- 13) The VVVF Panels shall be properly tagged and duly ferruled as per approved drawings.
- 14) All the terminals shall be properly tagged and ferruled and control and power cables shall be ferruled and duly socketed.
- 15) The VVVF Panels shall be supplied with HMI device to control and operate and it should be mounted on the Panel door.

- 16) The Control wiring shall be done with 2.5 sq.mm. PVC insulated flexible stranded copper conductor and duly lugged, ferruled and socketed.
- 17) The Power connections shall be done with copper conductor stranded flexible cables / copper bus –bars of suitable rating. This shall be clearly specified by the bidder.
- 18) The VVVF Panels shall have a 230 Volts AC plug and socket for auxiliary supply along with proper illumination with CFL Lamp for each panel with door interlock.
- 19) The VVVF Panels shall also have Thermostat and space heater.
- 20) The 3 phase copper bus-bars (if any) shall be properly covered with PVC sleeves maintaining proper color coding.
- 21) In addition to above each of the VVVF Panels shall have earth bus-bar at the bottom to facilitate the continuity of earthing connections.
- 22) The VVVF Panels shall have 3-pole Input and Output Contactor of suitable rating for incoming and outgoing 3-phase supply voltage.
- 23) The VVVF Panels shall also have the provision of the following:
  - a) Digital Inputs: min. 6 nos. for START/STOP, RUN ENABLE, EXTERNAL FAULT, SPEED INC./DEC., PLC/LOCAL reference selection etc.
  - b) Analog Inputs: 0 - 10 Volts – 1 no.  
Analog Input: 4 – 20 mA for PLC control – min. 2 nos.
  - c) Analog Outputs: 4 – 20 mA for Current feedback and Speed feedback – min. 3 nos. with spare
  - d) Potential free relay output contacts: min. 3 nos., 1 no. each for Drive healthy, Drive running and Drive fault status.
- 24) The VVVF Panels shall have 2 nos. of 4 – 20 mA dual output channel Current transducers duly connected and wired for 4 – 20 mA current and speed feedback to PLC and Local Control Station. The auxiliary supply for transducers shall be 230 Volts AC.
- 25) Accepted make of components of VVVF Panels:
 

VVVF Drive module: ABB

Contactors: SIEMENS / L & T / SCHNEIDER / ABB

Push buttons: SIEMENS / L & T / SCHNEIDER

Indication Lamps: SIEMENS / L & T / VAISHNO

Meters: Automatic Electric / Conzerv / IMP

SFU: SIEMENS / L & T

MCB and MPCB: SIEMENS / HAGER (L & T) / ABB

Emergency Stop push buttons: TEKNIC/VAISHNO

Control Fuses: EE / SIEMENS / L & T /

Current Transducers: Automatic Electric

Selector Switches: Kaycee or equivalent.

26) The control circuit scheme for VVFD Panels has been indicated below.

27) The following shall be furnished with the offer:

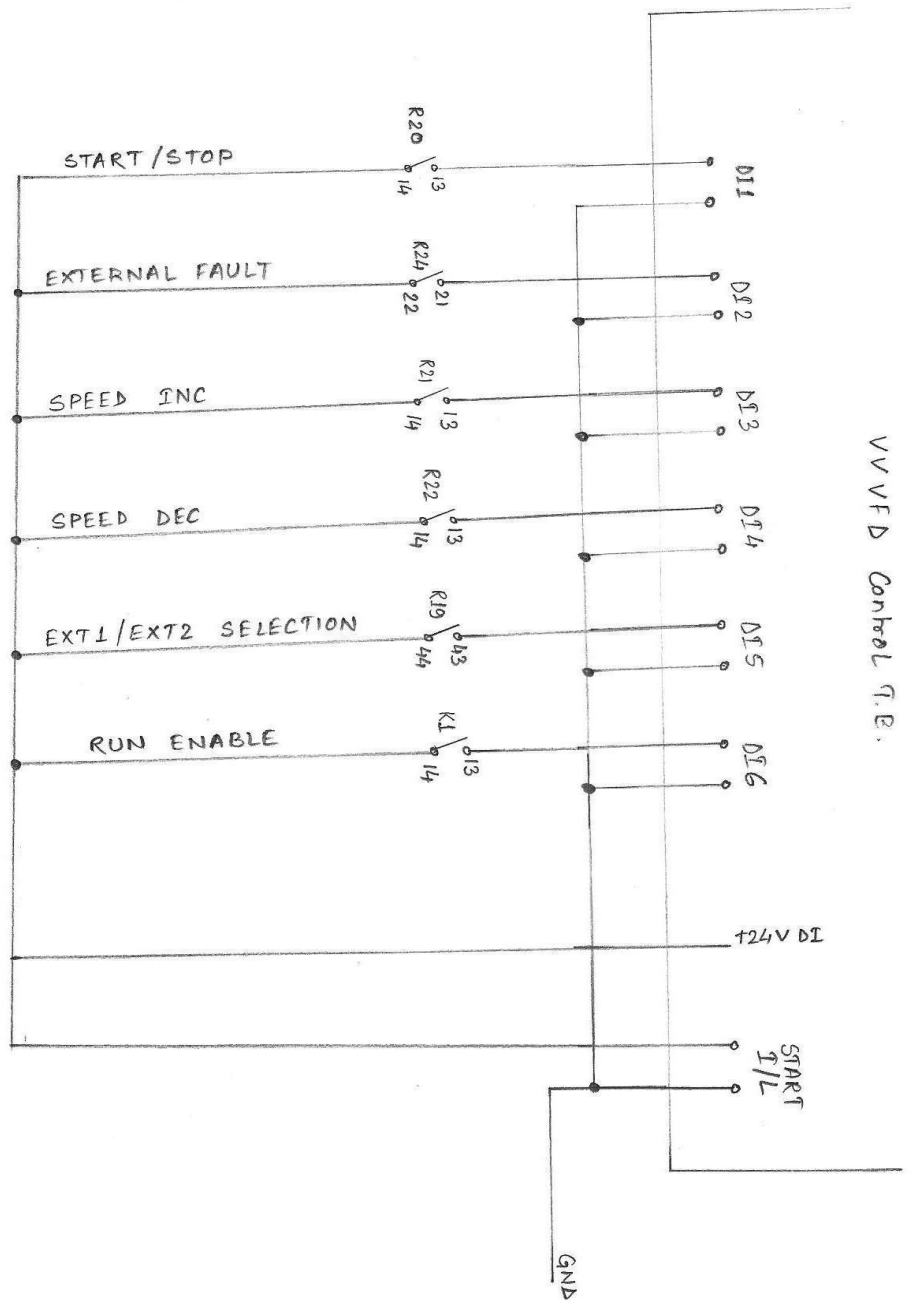
1. Dimensional G.A. drawing of the offered VVFD Panels.
2. Internal component lay out of the VVFD Panel clearly showing the clearances.
3. Bill of materials with make, type, rating and quantity.
4. Single line drawing of the VVFD Panels.
5. Drawing of the control circuit of the VVFD Panels.
6. Deviations from the tender specifications if any.

#### **CONTROL CIRCUIT FOR VVFD PANELS**



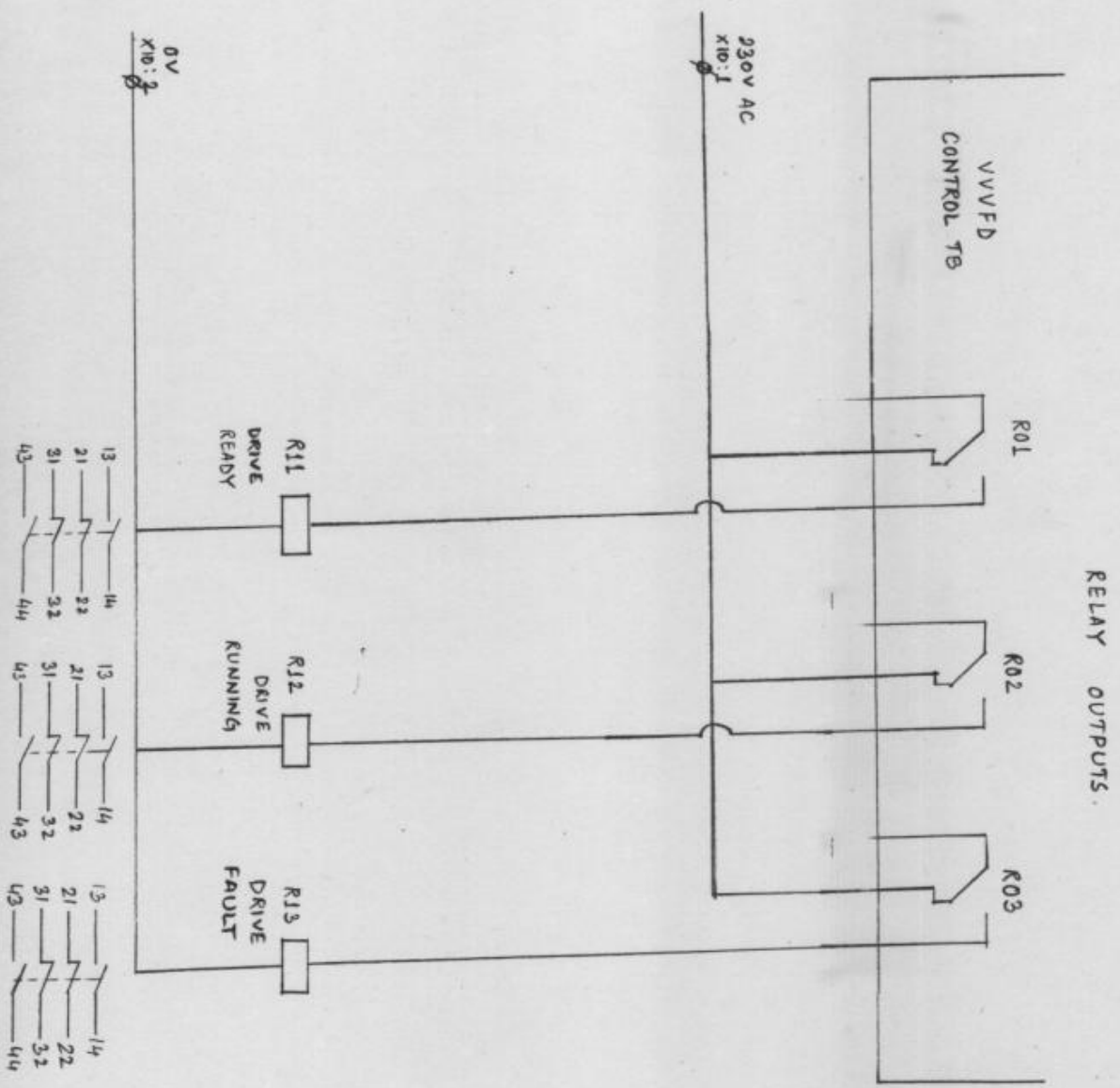


# VVVF Control T.E.

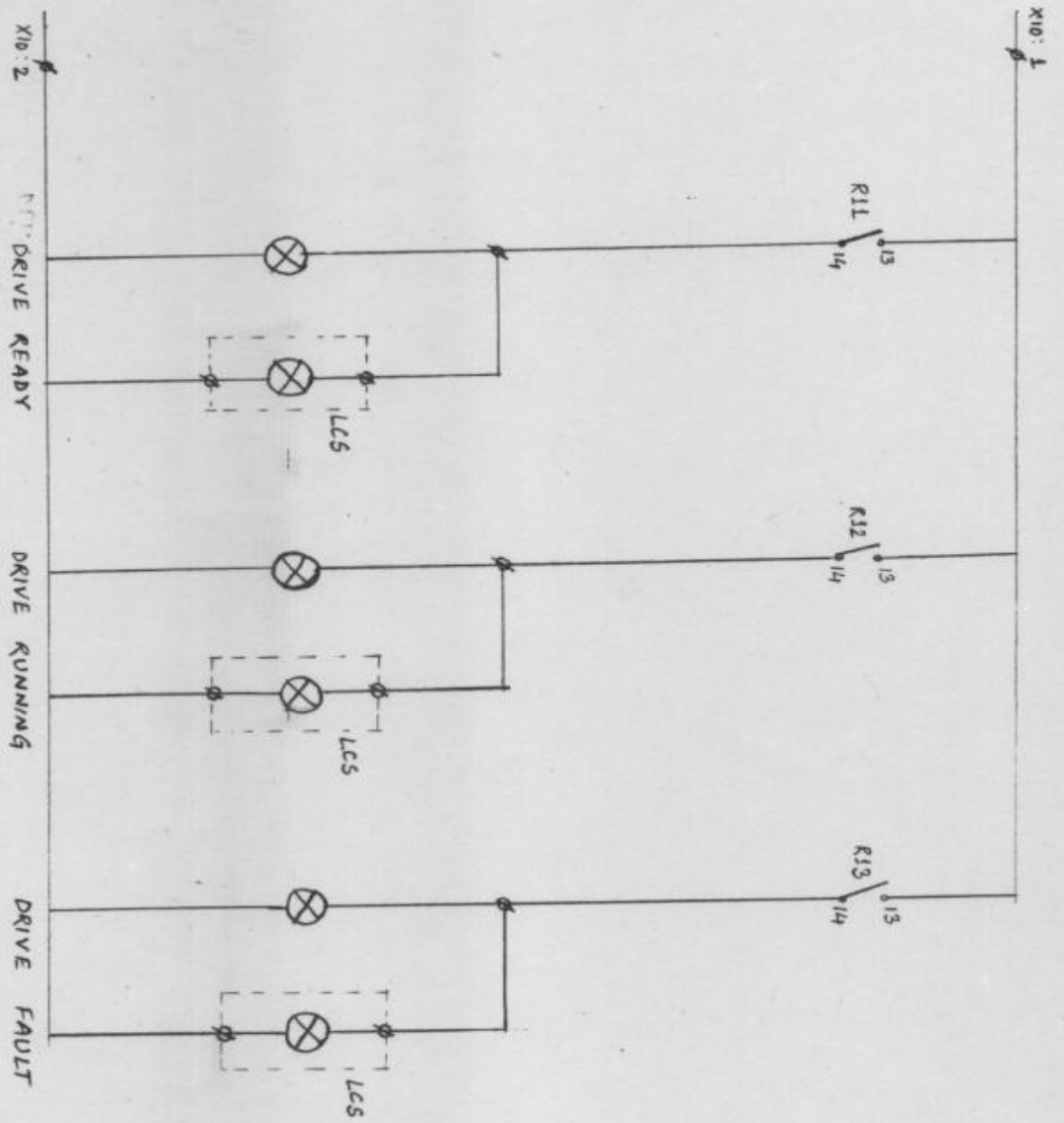


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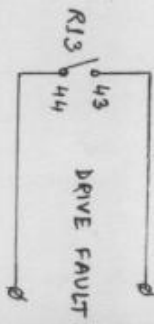
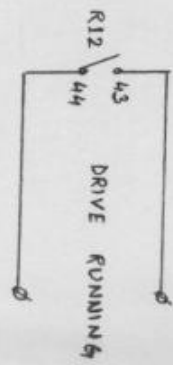
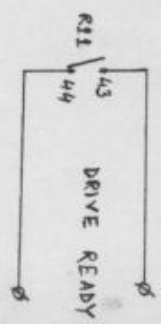




# INDICATION CKT.



Feedback to PLC.



## **ANNEXURE-A**

### **RATINGS AND REQUIREMENTS - A.C. DRIVES**

<b>1.0</b>	<b>General</b>	<b>:</b>	<b>Frequency controlled AC drive</b>
	<b>Type</b>	<b>:</b>	<b>Enclosed panel</b>
	<b>Service</b>	<b>:</b>	<b>Indoor</b>
	<b>Enclosure</b>	<b>:</b>	<b>IP 55</b>
<b>2.0</b>	<b>System</b>		
	<b>Voltage</b>	<b>:</b>	<b>415V <math>\pm</math> 10%</b>
	<b>Frequency</b>	<b>:</b>	<b>50 Hz <math>\pm</math> 3%</b>
<b>3.0</b>	<b>Duty</b>	<b>:</b>	<b>Continuous</b>
<b>4.0</b>	<b>Application</b>	<b>:</b>	<b>Motor speed control</b>
<b>5.0</b>	<b>Overload</b>	<b>:</b>	<b>160% of rated output for 30 secs. (minimum in every 5 minutes)</b>
<b>6.0</b>	<b>Braking of Motor</b>	<b>:</b>	<b>Dynamic</b>

**SECTION : III/2**

**SUB-SECTION : E-006**

**POWER FACTOR CORRECTION CAPACITOR**

SECTION III/2

SUB-SECTION : E-006

POWER FACTOR CORRECTION CAPACITOR



## CONTENTS

<u>CLAUSE</u>	<u>DESCRIPTION</u>
1.00.00	DESIGN CRITERIA
2.00.00	SPECIFIC REQUIREMENTS

## SECTION III/2

### SUB-SECTION : E-006

#### POWER FACTOR CORRECTION CAPACITOR

##### **1.00.00 DESIGN CRITERIA**

1.01.00 HT Power Capacitor shall be installed to improve power factor of individual H.T. motor.

1.02.00 Each 6.6 KV capacitor bank shall be connected across the terminals of individual H.T. motor and be switched with the motor as one unit. The kVAR rating of the capacitor shall be chosen in coordination with the magnetizing kVA of the motor. As a general rule the size of the capacitor for individual correction of a motor shall not preferably exceed 85% of the normal no-load kVA of the motor.

1.03.00 Arrangement shall be made to avoid re-application of voltage immediately after switching off, till the terminal voltage of the capacitor goes below 10% of the rated voltage.

##### **2.00.00 SPECIFIC REQUIREMENT**

##### **2.01.00 Construction**

2.01.01 The capacitor to be connected across the motor shall consist of several small three-phase capacitor units connected in parallel to form a three-phase capacitor bank.

2.01.02 The units shall be hermetically sealed for complete protection against leaks. All joints in the steel casing shall be welded and tested for liquid tightness.

2.01.03 Terminals of the capacitor units shall be brought out through porcelain bushings. These small capacitor units shall be connected in parallel by means of horizontal three phase aluminium busbars of adequate size and shall be put in a rigidly constructed welded steel enclosure with adequate support and maintenance facilities.



- 2.01.04      The entire capacitor bank shall be of self supporting, floor mounting type.
- 2.01.05      The cable box for H.T. capacitor bank shall be suitable for terminating 6.6 kV (UE) voltage grade XLPE insulated stranded aluminium cable of the required size.
- 2.01.06      Two (2) earthing terminals shall be provided at the foot of the opposite sides of the metallic enclosure of the capacitor bank. Proper earth continuities shall be ensured for each capacitor unit, busbar chamber, all metallic supports etc.

- 2.02.00      **Rating**
- 2.02.01      In deciding the kVAR rating of a capacitor, principle stated in design criteria under clause 1.00.00 shall be followed.
- 2.02.02      The capacitors shall be rated considering the site conditions like maximum ambient temperature prevailing at site etc.
- 2.02.03      The system configuration like voltage & frequency with variations, fault level, system grounding etc. shall be followed for determining the rating of capacitors.
- 2.02.04      The capacitor units shall be suitable for continuous operation at an r.m.s. line current not exceeding 1.30 times the current which occurs at rated sinusoidal voltage and rated frequency excluding transients.
- 2.02.05      The capacitor units shall be suitable for prolonged operation at an r.m.s. voltage between terminals not exceeding 1.10 times the rated voltage excluding transients.
- 2.03.00      **Protection**
- 2.03.01      All capacitors shall be suitably protected against over-current and short circuit.
- 2.03.02      Capacitor unit shall also be protected against internal faults and the affected units/banks shall be automatically and immediately isolated to the event of such faults.
- 2.04.00      **Discharge Resistor**
- The capacitor units shall be provided with internal discharge resistors built into the unit to reduce the residual voltage to a safe value within the time specified in relevant standard after the capacitor has been disconnected from the supply.

For the above, the tenderer shall carefully consider the interval between two successive starts of the drive motor under consideration from the operational point of view.

### **MAKE OF VARIOUS ELECTRICAL ITEMS:**

- Cable – HT, LT & Control : Gloster / CCI / Poly Cab / KEI
- Motor : ABB / Siemens / CG / Kirloskar
- Panel / Contactor : L&T / Siemens
- Air Circuit Breaker : L&T / Siemens / GE
- Overload Relay : Siemens / L&T
- Connector : Elmes / Connectwell
- Push Button : Siemens / L&T / ESAB
- Indication Lamp : ESAB / L&T / Siemens / Teknik
- Fuse : Siemens / L&T
- Control fuse : GE / Siemens
- Switch : L&T / Siemens
- VVFD : ABB (ACS 800 series)
- Meter : Automatic Electric / Meco
- Capacitor : ABB / EPCOS

**SECTION: III/3**

**INSTRUMENTATION**

## **1.0 TECHNICAL SPECIFICATIONS – INSTRUMENTATION**

### **1.1 Control & Operation Philosophy:**

Control and monitoring from Control Room through PLC has been envisaged in this project.

The Control Desk, VVFD Panel, Thyristor Panel and PLC panel shall be placed in the one room where all PLC VVFD Panel, Thyristor Panel and exchange signals shall be terminated. Control room shall be dust free Air Conditioned room having two (2) air conditioning Unit (1 working & 1 stand by).

**PLC System, Control Room and Room Air-conditioning, Room Lighting etc is excluded from the scope of present job and shall be provided by the purchaser for above plant.**

**REMARK:** Bidder has to submit approximate dimensions of above equipment (i.e. Control Desk, VVFD Panel and Thyristor Panel) in the technical part of the offer so that control room size can be finalised by the purchaser.

There shall be a three position selector switch for each & every drive/Valves (PLC/LOCAL/OFF). Selection of the mode i.e. PLC/LOCAL would be done through the Selector Switch at Control Desk in Control Room.

1. **PLC Operation Mode** (From HMI Station from Control Room)

2. **Local Operation Mode**

- a) **PLC Operation:** In PLC operation mode, CRT and keyboard would carry out whole sequence of operation of each section from central control room through PLC system. Also in this type of operation, the sequential operation of the drive can be performed by group selection mode as well as individual selection mode.
- b) **Local Operation Mode:** In this mode starting and stopping of the drives will be carried out from Local Pushbutton Station (LPBS) by pushbuttons. LPBS would be suitably located near to each drive. Safety interlocks and protection of equipments should be provided hardwired into the drive level at MCC.

However, LOCAL STOP Push Button will always remain active in both the modes. In case of failure of HMI Station/PLC, any/all equipment can be stopped by selecting OFF position of respective Mode Selector Switch at Control Room

All exchange of "Start Command" / "Stop Command" from PLC / Local Start Stop Push Button Station to MCC, "Started Feed Back" / "Stopped Feed Back" from MCC to PLC Panel shall be routed directly to avoid duplication of terminals. All Annunciations shall be provided in PLC HMI SCADA as listed elsewhere.

As shown in MCC Scheme, One **EMERGENCY STOP** Push Button at Control Desk has been envisaged. **Complete plant can be stopped by pressing above push button in PLC Mode only.**

### **1.2 Scope of Supply (For Instrument)**

1.2.1 Scope of supply by tenderer grossly includes the following:

- 1.2.1.1 Control Panel having all Entire electrical accessories like, Local/ PLC /OFF Mode Selector Switch, Indicating Lamp.
- 1.2.1.2 All Field Instruments as mentioned in the BOM.
- 1.2.1.3 Pneumatically Operated Knife Edge Gate Valve, Single Acting for Suction point of Pumps
- 1.2.1.4 Pneumatically Operated Knife Edge Gate Valve, Double Acting for Discharge point of pumps and Hydrocyclones
- 1.2.1.5 Pneumatically Operated Diaphragm Valve for Water Flushing at Suction point of Pumps
- 1.2.1.6 Pneumatically Operated Diaphragm Control Valve for Water addition control loop.
- 1.2.1.7 Local Start Stop Push Button Stations
- 1.2.1.8 Power Supply distribution box
- 1.2.1.9 Field Junction Boxes
- 1.2.1.10 Erection Hardware
- 1.2.1.11 Power, Control & Instrument cables

The Bill of material (Instrumentation part) is given in the tender document separately.

**Exclusion (For Instrumentation Part Only):** Supply of following Control and Instrument signal cable are excluded from the scope of supply

- PLC to Field Junction Box
- PLC to MCC
- PLC to VVFD
- PLC to Control desk

### **1.3 Scope Of Services**

- 1.3.1 **Erection & Installation:** Installation of all sensors, instruments and transmitters, control panel, etc. which are covered under the scope of supply and cable laying & termination between Local Pushbuttons, MCC & Control Desk, MCC & PLC, Control Desk & PLC as listed below:
  - Field to Field Junction Box (JB)
  - MCC to Control Panel
  - Control Desk to Local Push Button Station
  - Control Desk to MCC
- 1.3.2 **Calibration & Commissioning:** Individual calibration of all erected instruments, control loop commissioning and complete system testing is under the scope of supply and services. Pressure switches, gauges of mill Lubrication system and Flow switch of the mill bearing cooling water shall be calibrated from NABL accredited third party laboratory.
- 1.3.3 **Power Supply And Its Distribution:** Purchaser will provide single Phase AC power supply at single point for field instruments and Control desk. Further distribution of power supply shall be in Tenderers' scope. Solenoids shall be powered with 24V DC power supply through interposing relays. Any other power supply required for C&I system will be generated by Tenderer from the available power supplies. All instruments will be given UPS power from existing source, which will be in the scope of purchaser.

#### 1.3.4 **Cabling:**

- 1.3.4.1 All the Cables runs shall be properly identified by number tags which shall be provided at both field ends and Junction box ends.
- 1.3.4.2 The wires laid shall not be subjected to excessive tension. Termination shall be made with proper lugs and ferrule.
- 1.3.4.3 Not more than one wire shall be terminated on the each side of terminal blocks. Double Decker / internally shorted terminal blocks shall be used wherever required for distribution purpose.
- 1.3.4.4 **Pre printed tube type ferrules with cross termination details** shall be used.
- 1.3.4.5 The cables must be routed away from strong magnetic and electric fields.
- 1.3.4.6 There should be no intermittent joints in the cable.
- 1.3.4.7 The wires must be tagged to enable easy identification.

#### 1.3.5 **Analog Measurement:**

- 1.3.5.1 Flow of Magnetite Slurry to Hydrocyclones
- 1.3.5.2 Pressure at Inlet of Hydrocyclones
- 1.3.5.3 Level measurement of Mill discharge tank and 2 nos. of sumps.
- 1.3.5.4 Make up water addition system for Mill discharge tank
- 1.3.5.5 Bearing temperature measurement of Mill.
- 1.3.5.6 Bearing temperature and Winding temperature measurement of Mill Drive Motor.
- 1.3.5.7 Mill bearing Cooling water temperature measurement
- 1.3.5.8 Mill motor current and power measurement
- 1.3.5.9 Make up water flow to Mill discharge tank

#### 1.3.6 **Closed Control Loops (in PLC):**

- 1.3.6.1 Mill discharge tank level control. **Process Variable:** Level of mill discharge tank, **Manipulated Variable:** Pump speed through VVFD & Water addition control valve.

#### 1.3.7 **Process Interlocks**

- 1.3.7.1 Tripping of any lubrication pump will trip the mill.
- 1.3.7.2 The mill shall trip in case of bearing Cooling water is high to a permissible limit.
- 1.3.7.3 The Magnetite clarifier motor and all water input to the system shall trip in case of mill discharge tank attain a level of 95%
- 1.3.7.4 The whole system shall trip in case of non-availability of pneumatic air supply.
- 1.3.7.5 The mill shall trip in case of seal water pressure is less than 2.0 Kg/cm<sup>2</sup>.

#### 1.3.8 **List of Annunciation (in PLC HMI)**

- 1.3.8.1 Mill bearing drive end temperature high
- 1.3.8.2 Mill bearing non-drive end temperature high
- 1.3.8.3 Mill bearing Cooling Water outlet temperature high

- 1.3.8.4 Mill discharge tank level low
- 1.3.8.5 Mill discharge tank level high
- 1.3.8.6 Seal water pressure low
- 1.3.8.7 Cyclone inlet pressure High
- 1.3.8.8 LP-1 pump tripped
- 1.3.8.9 LP-2 pump tripped

#### **1.4 Bill of Material (Instrumentation)**

Sl. No.	Description of Material	Quantity
1	Pressure Transmitter (with 2" diaphragm)	2
2	Current to Pressure Converter	1
3	Flow Transmitter (50NB)	1
4	Flow Transmitter (100NB)	2
5	Control Valve (50NB)	1
6	Level Transmitter (Non Contact Radar type)	3
7	Solenoid operated Saunders type On/OFF valve (50NB)	2
8	Knife gate valve with double acting cylinder (100NB) for pump discharge and Hydrocyclones	8
9	Knife gate valve with Single acting cylinder (150NB) for pump suction line	2
10	Solenoid Valve	12
11	Pressure Gauge (diaphragm Type)	4
12	Temperature Transmitter (RTD Input)	15
13	Digital Indicating type Pressure Switches for HP & LP of Mill Bearing Lubrication System	2
14	Digital Indicating type Flow Switches for Trunnion Bearing Cooling water Flow and LP of Mill Bearing Lubrication System	3
15	Control Desk	1
16	Pneumatic fittings, Air filter cum regulators, Impulse tubing, Cable Glands, Local Display with enclosure	1 lot
16	Field Junction boxes, AC/DC power distribution box, MCB for power distribution, ferrule, Lugs etc	1 lot



	Power, Control & Instrumentation Cables	1 lot
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## 1.5 Specification

### 1.5.1 SPECIFICATION OF MAGNETIC FLOWMETER (4")

1	Type	:	Separate Flow tube and electronic unit
2	Line Size	:	4" (100NB)
3	Process Details		
a	Application	:	Magnetite Slurry
b	Material Density	:	~1.3 g/cu.cm to 2.0 g/cu.cm
c	Flow Range	:	30 to 90 M <sup>3</sup> /hour
d	Line pressure	:	3.0 Kg/Sq. cm (Nominal), 5.0 Kg/Sq. cm (Maximum)
4	Signal Output	:	4 to 20mA
5	Comm. Protocol	:	HART
6	Power Supply	:	230 Volt, AC
7	Material		
a	Measuring Tube	:	SS 316, PTFE lined (lining thickness : 3mm)
b	Sensing Electrode	:	Hastealloy – C
8	Local Display	:	2 Line 16 character or Dot Matrix LCD Display
9	Display Option	:	Online Flow, fluid velocity & totaliser display
10	Programming	:	By Programmable keys provided on front panel & HART
11	End Connection	:	Flanged ANSI 150#, Drilled as per ANSI 16.5
12	Grounding Ring	:	Mounted on Measuring Head on both Flanges. (Grounding ring with neck for Protection of liner of measuring tube.)
13	Enclosure	:	The Enclosure of Converter unit as well as Magnetic head should be Waterproof designed for outdoor application (As per IP 68)
14	Accessories	:	1. Mounting arrangement for Electronic unit, 2. Sensing Cable (for connecting Measuring head and Converter Unit), length - 10 mtrs 3. Cable Glands, User manual, etc.

<b>1.5.2 SPECIFICATION OF MAGNETIC FLOWMETER (2")</b>			
1	Type	:	Separate Flow tube and electronic unit
2	Line Size	:	2" (50NB)
3	Process Details		
a	Application	:	Industrial Water
b	Material Density	:	~1.0
c	Flow Range	:	10 to 25 M <sup>3</sup> /hour
d	Line pressure	:	3.0 Kg/Sq. cm (Nominal), 5.0 Kg/Sq. cm (Maximum)
4	Signal Output	:	4 to 20mA
5	Comm. Protocol	:	HART
6	Power Supply	:	230 Volt, AC
7	Material		
a	Measuring Tube	:	SS 316, PTFE lined (lining thickness : 3mm)
b	Sensing Electrode	:	Hastealloy – C
8	Local Display	:	2 Line 16 character or Dot Matrix LCD Display
9	Display Option	:	Online Flow, fluid velocity & totaliser display
10	Programming	:	By Programmable keys provided on front panel & HART
11	End Connection	:	Flanged ANSI 150#, Drilled as per ANSI 16.5
12	Grounding Ring	:	Mounted on Measuring Head on both Flanges. (Grounding ring with neck for Protection of liner of measuring tube.)
13	Enclosure	:	The Enclosure of Converter unit as well as Magnetic head should be Waterproof designed for outdoor application (As per IP 68)
14	Accessories	:	1. Mounting arrangement for Electronic unit, 2. Sensing Cable (for connecting Measuring head and Converter Unit), length - 10 mtrs 3. Cable Glands, User manual, etc.

### 1.5.3 SPECIFICATION OF CONTROL VALVE (Size 2")

1	Type	:	Plug Type, Reverse Acting (Air to Open)
2	Line Size	:	2" (50 NB)
3	Flow Range	:	Nominal : 15 to 20 M <sup>3</sup> /Hr
			Maximum : 25M <sup>3</sup> /Hr
4	Purpose	:	Flow Regulating
5	Line pressure	:	4.0 Kg/cm <sup>2</sup> (Max)
6	Material	:	
a	Valve Body	:	EPDM lined Cast Iron (lining thickness 3 mm)
b	Trim	:	Natural Rubber diaphragm
c	Actuator Stem	:	SS 316
7	Rating	:	150 lbs
8	Plug Characteristics	:	Control (Equal Percentage)
9	Air Supply Pressure	:	3.0 Kg/cm <sup>2</sup>
10	Input	:	4 to 20mA
11	Fail Safe	:	Valve Close
12	Manual Override	:	Manual override by Handwheel
13	Accessories	:	Positioner with gauge group, Air Filter regulator
14	Application	:	Industrial Water of 6.5 to 8.0 pH
15	End Connection	:	Flanged as per ANSI 150, Flange Drilling as per ANSI 16.5

### 1.5.4 SPECIFICATION OF LEVEL TRANSMITTER

1	Type	:	Pulsed Radar Type level transmitter for Slurry application, Separate Transducer and processing (Display) unit
2	Range	:	Upto 5 meters
3	Connection type	:	4 wire
4	Accuracy	:	0.1% of Full scale
5	Process Temperature	:	Ambient ( 5 to 50 deg. C)
6	Application	:	Sump application and open Tank level measurement
7	Display	:	4 line 30 character LCD or Graphical Display
8	Current output	:	4 to 20mA corresponding to actual level
9	Power Supply	:	230V AC, 50 Hz
10	Programming Keys	:	Through feather touch keys mounted on the processing unit
11	Programming Mode	:	Programming through programmable keys, HART
12	Cable Entry	:	2 X Cable entry 1/2" NPT
13	Material	:	
a	Housing	:	PVC/ Polycarbonate
b	Antenna	:	PTFE Coated
c	Flange	:	2: SS 316 ANSI 150#
14	Sensor connecting cable	:	Prefabricated 10 meters cable for connecting sensor and processing (Display) unit
15	Accessories	:	Cable glands, Wall mounting accessories for processing unit

### 1.5.5 SPECIFICATION OF SMART PRESSURE TRANSMITTER

1	Type	:	2 Wire, smart diaphragm type pressure transmitter
2	Range	:	0 to 4 Kg/Cm <sup>2</sup> (Programmable)
3	Accuracy	:	± 0.1% of FSV

4	Power Supply	:	18 to 32 Volts
5	Output	:	4 to 20mA
6	Programming	:	Through HART and Zero & Span through keys mounted on the transmitter
7	Diaphragm dia	:	2"
8	Process Connection	:	Flanged Rating 150#
8	Electric connection	:	1 X Cable entry 1/2" NPT (Cable glands to be provided)
9	Material		
a	Housing	:	SS 316
b	Wetted Part	:	Hastealloy C
c	Measuring Cell filling	:	Silicone Oil
10	Operating Temp.	:	0 to 55 deg. C
11	Media Temperature	:	60 deg. C (Max)
12	Degree of Protection	:	IP 68

### 1.5.6 SPECIFICATION OF SOLENOID VALVE

1	Type	:	3/2 or 5/2 Way Solenoid Valve (as required)
2	Operation	:	Direct Acting
3	I/P Voltage	:	24 V DC
4	Coil Insulation Class	:	F Class
5	Coil wattage	:	Up to 11.2 Watts or less
6	Solenoid Body Material	:	3/2 way valve: SS 316 5/2 way valve: SS316/SS304/Brass/Aluminum
7	Power Indication	:	through LED
8	Process Connection	:	1/4" NPT threaded ports
9	Orifice size	:	2.5 mm minimum

10	Response Time	:	15mSec
11	Electrical Connection	:	Directly connected Screwed type connector with Cable Gland OR with Plug type Connector
12	Enclosure	:	IP-65
13	Application	:	Compressed Air
14	Process Pressure	:	3.0 to 5.5 Kg/Cm <sup>2</sup>
15	Manual Override	:	Screwed Type, Stay put
16	Mounting Bracket	:	To be Provided

### 1.5.7 SPECIFICATION OF PNEUMATICALLY OPERATED SAUNDERS VALVE

1	Type	:	Saunders Valve, Type-K, Reverse Acting (Air to Open)
2	Line Size	:	2" (50 NB)
3	Purpose	:	ON/OFF
4	Line pressure	:	4.5 Kg/cm <sup>2</sup> (Max)
5	Material	:	
a	Valve Body	:	Grey cast Iron BS EN 1561, Grade:EN-GJL-250 Phosphated & Black epoxy painted
b	Body Lining	:	Butyl Rubber Lined, Hardness 60 to 65 Shore A
c	Lining thickness	:	Minimum 2.5 mm
d	Operating Diaphragm	:	Butyl Rubber
e	Bonnet	:	Grey Cast Iron BS EN 1581, Grade: ENGJL – 250 Phosphated & Black epoxy painted
f	Spindle	:	Carbon steel Grade SAE 1018
g	Handwheel	:	Grey Cast Iron BS EN 1561 Grade EN GJL 200
h	Compressor	:	Grey Cast Iron BS EN 1561 Grade EN GJL 200
i	Rating	:	150 lbs
6	Air Supply Pressure	:	3.0 Kg/cm <sup>2</sup>

7	Fail Safe	:	Valve Close
8	Manual Override	:	Manual override by Handwheel
9	Application	:	Industrial Water of 6.0 to 8.0 pH
10	End Connection	:	Flanged Flat surface as per ANSI 150, Flange Drilling as per ANSI 16.5
11	Leakage Rate	:	Class VI (100% leak tight)

### 1.5.8 SPECIFICATION OF KNIFE EDGE GATE VALVE (Double Acting)

1	<b>VALVE TYPE</b>	:	Single piece body, Cast Monoblock Knife gate valve Double seated, Bidirectional, Full rubber sleeve design valve
2	Valve rating	:	10 Kg/Sq. cm.
3	End connection	:	Wafer Type, Semi Lugged Design
4	Flange	:	As per ANSI 150
5	drilling Standard	:	ANSI 16.5
6	Packing	:	Packing less design (No gland or stem packing)
7	Air Cylinder	:	Double acting cylinder
8	Flush Guard	:	to be provided
9	Size	:	4"/100NB
	<b>PROCESS CONDITION</b>		
10	Fluid	:	Magnetite Slurry
11	Process Flow	:	30 - 90 M <sup>3</sup> /Hr,
12	Fluid Temperature	:	Ambient (5 to 45 deg. C)
13	Line Pressure	:	3 to 4 Kg/cm <sup>2</sup>
14	Density	:	1.3 to 2.0 T per M <sup>3</sup>
	<b>MATERIAL</b>		
15	Valve Body	:	CF8M Stainless steel (AISI SS 316)
16	Valve Gate	:	Hard Chromed plated SS 316L
17	Guard follower	:	Stainless steel

18	Valve sleeve		Full natural soft rubber sleeve (shore Hardness 40-45) HTP-EPDM
19	Air Cylinder	:	SS 316
20	Gate Lining	:	Fully Elastomer line (no metal part in contact with Flowing Fluid)
21	Packing		PTFE Impreg. Synthetic, Fiber
22	<b>Fasteners</b>		Stainless steel 304
23	O' ring		EPDM
24	Actuator		Single acting pneumatic cylinder actuated
25	Cylinder/Cover		Metallic cylinder
26	<b>ACCESSORIES</b>		
	Gate guard	:	Metallic powder coated gate guard on both side of movement of gate
27	Stem/Cylinder Piston Cover	:	Stem has got bellows to protect from dust and slurry
28	Manual Option	:	Operation through Handwheel (Top Mounted)

### 1.5.9 SPECIFICATION OF KNIFE EDGE GATE VALVE (Single Acting)

1	<b>VALVE TYPE</b>	:	Single piece body, Cast Monoblock Knife gate valve Double seated, Bidirectional, Full rubber sleeve design valve
2	Valve rating	:	10 Kg/Sq. cm.
3	End connection	:	Wafer Type, Semi Lugged Design
4	Flange	:	As per ANSI 150
5	drilling Standard	:	ANSI 16.5
6	Packing	:	Packing less design (No gland or stem packing)
7	Air Cylinder	:	Single acting cylinder
8	Fail Safe	:	Valve Closes
9	Flush Guard	:	to be provided
10	Size	:	6"/150 NB



**Pipe size and valve sizes are tentative only .Party has to supply as per their final approved design.**

	<b>PROCESS CONDITION</b>		
11	Fluid	:	Magnetite Slurry
12	Process Flow	:	70 - 200 M <sup>3</sup> /Hr
13	Fluid Temperature	:	Ambient (5 to 45 deg. C)
14	Line Pressure	:	3 to 4 Kg/cm <sup>2</sup>
15	Density	:	1.3 to 2.0 T per M <sup>3</sup>
	<b>MATERIAL</b>		
16	Valve Body	:	CF8M Stainless steel (AISI SS 316)
17	Valve Gate		Hard Chromed plated SS 316L
18	Guard follower	:	Stainless steel
19	Valve sleeve		Full natural soft rubber sleeve (shore Hardness 40-45) HTP-EPDM
20	Air Cylinder	:	SS 316
21	Gate Lining	:	Fully Elastomer line (no metal part in contact with Flowing Fluid)
22	Packing		PTFE Impreg. Synthetic, Fiber
23	<b>Fasteners</b>		Stainless steel 304
24	O' ring		EPDM
25	Actuator		Double acting pneumatic cylinder actuated
26	Cylinder/Cover		Metallic cylinder
27	<b>ACCESSORIES</b>		
	Gate guard	:	Metallic powder coated gate guard on both side of movement of gate
28	Stem/Cylinder Piston Cover	:	Stem has got bellows to protect from dust and slurry
29	Manual Option	:	Operation through Handwheel (Top Mounted)
<b>1.5.10</b>	<b>SPECIFICATION OF Field Junction Boxes</b>		
1	<b>Type</b>	:	Weather & Dust Proof one piece enclosure body Left Hand hinge

			Loackable with 1/4 turn latch with slotted head insert
2	Dimension	:	250 mm X 200mm X 100mm (Field Junction Boxes)
3	Mounting	:	Wall mounting (Wall mounting bracket to be provided)
4	Sealing	:	Foamed-in-place Polyurethane gasket
5	Material / Finishing	:	Sheet Steel of 1.5mm thickness, painted in powder coated texture
6	Terminal blocks	:	DIN rail Mounted in single line (20% of Terminal block shall be spares for future use)
7	Gland Plate	:	Bottom gland plate for Cable entry
<b>1.5.11</b>	<b>SPECIFICATION OF Enclosure of ACDB and DCDB</b>		
1	<b>Type</b>	:	Weather & Dust Proof one piece enclosure body Left Hand hinge Loackable with 1/4 turn latch with slotted head insert
2	Dimension	:	250mm X 200mm X 150mm
3	Mounting	:	Wall mounting (Wall mounting bracket to be provided)
4	Sealing	:	Foamed-in-place Polyurethane gasket
5	Material / Finishing	:	Sheet Steel of 1.5mm thickness, painted in powder coated texture
6	MCB's	:	DIN rail Mounted in single line (at least 2 MCB shall be spare in each enclosure for future use)
7	Gland Plate	:	Bottom gland plate for Cable entry
<b>1.5.11</b>	<b>SPECIFICATION OF INSTRUMENT SIGNAL / CONTROL/ POWER CABLE</b>		
<b>A</b>	<b>INSTRUMENT SIGNAL CABLE</b>		
1	Type	:	Twisted Pair
2	Conductor	:	20 AWG Multistrands annealed pain copper extruded PVC
3	Inner sheath	:	Extruded PVC
4	Mode of warping layers	:	Mylar tape and filter chord
5	Mode of individual & overall shielding	:	Aluminized Mylar tape wrapped with 25% overlapping

6	Overall sheath of the cable	:	FRLS PVC
7	Continuous operating temperature	:	70 Deg. C
8	Voltage grade	:	600 Volts
9	Armouring	:	Rounded GI wire/ strip with overlapping
10	Signal drain wire	:	Continuous tinned copper under the aluminum side of the screen.
11	Core Identification	:	By standard colors as well as numbering at frequent intervals
12	Standard Pair	:	1 Pair, 2 Pairs, 6 pairs, 12 Pairs, 9 Triads (as applicable)
13	Cable Marking	:	Meter marked throughout the cable
14	Standards	:	As per IS:5308/IS:1554
<b>B</b>	<b>INSTRUMENT CONTROL CABLE</b>		
1	Type	:	Multicore
2	Conductor	:	1.0 Sq. mm multi-strand annealed plain copper
3	Inner sheath	:	Extruded PVC
4	Continuous operating temperature	:	70 Deg. C
5	Voltage Grade	:	600 V
6	Armouring	:	Round GI wire/strip with overlapping
7	Over all sheathing	:	FRLS PVC/Floropolymer insulation
8	Core identification	:	By standard colour as well as numbering at frequent intervals
9	No. of cores	:	3/5/7/14/21 as applicable
10	Making	:	Meter marked through out the cable length
11	Standards	:	As per IS:694/IS:1554
<b>C</b>	<b>INSTRUMENT POWER CABLE</b>		
1	Type	:	Multicore
2	Conductor	:	2.5 Sq. mm multi-strand annealed plain copper

3	Inner sheath	:	Extruded PVC
4	Continuous operating temperature	:	70 Deg. C
5	Voltage Grade	:	600 V
6	Armouring	:	Round GI wire with overlapping
7	Over all sheathing	:	FRLS PVC/Floropolymer insulation
8	Core identification	:	By standard colour
9	No. of cores	:	3 cores
10	Making	:	Meter marked through out the cable length
11	Standards	:	As per IS:694/IS:1554
<b>1.5.12</b>	<b>PRESSURE / TEMPERATURE / FLOW SWITCH</b>		
1	Type	:	Pressure Switch with indication
2	Range	:	As per process requirement
3	Output	:	4 to 20mA current output corresponding to displayed value
4	Accuracy	:	± 0.30% FSR
5	Power Supply	:	18 to 30 V DC
6	Display	:	1 X 8 dot matrix LCD with backlight
7	No. of Set point	:	2 (Two)
8	Set point Range	:	0 to 9999 counts
9	Relay contact rating	:	2 Independent relay contact each of 5Amp at 250V AC
10	Time delay	:	Programmable 0 to 250 Sec
11	Relay status	:	through LED indication for each set point
12	Dead band	:	0 to 9999 counts
13	Enclosure	:	Die cast Aluminum
14	Process connection	:	1/2" NPT
15	Material wetted part	:	SS 316

16	Process Temp.	:	5 to 100 deg. C
17	Ambient Temp.	:	5 to 60 deg. C

### 1.5.13 CONTROL DESK

1	Material of Construction	:	Cold rolled sheet steel
2	Thickness of sheet	:	2.00mm
3	Construction	:	Welded throughout
4	Post-welding operation	:	(i) Grounding of all welds to smoothness (ii) Rounding of corners (iii) Cleaning of weld spatters
5	Corners	:	7mm inner radius
6	Dimensional tolerances	:	(i) In height & length – 3mm (ii) In height between adjacent sections – 2mm (iii) Total for a group – 6 mm
7	Surface preparation	:	(i) Sand blasting (ii) Grounding (iii) Sanding for removal of rust & scale (iv) Solvent cleaning
8	Primer	:	Spray coat of epoxy surface
9	No. of primer coats	:	2 Nos.
10	Final Finish	:	Power Coating
11	Unacceptable imperfections	:	Sags, cracks, blisters, teardrops, fat edges, etc.
12	Doors	:	Double, recessed, turned back edges. Lift-off type for control desk (with additional bracings, as required).
13	Thickness of door sheet	:	2mm
14	Hinges	:	Stainless steel
15	Door gaskets	:	Three-point type

16	Door gaskets	:	Neoprene rubber on fixed frame
17	Opening of the doors	:	Outward
18	Louvers	:	With removable wire mesh to ensure dust and vermin proofness
19	Color of exterior	:	IS 5, shade 631 (Light Grey)
20	Color of interior	:	Enameled white
21	Gland plates	:	Removable 4mm thick undrilled, separate for desk and panel parts (top and/or bottom depending on Cable/Impulse pipe entry)
22	Internal dissipation	:	500 W/m <sup>3</sup> (max)
23	Cable entry	:	Backside
24	Hardware accessories	:	<ul style="list-style-type: none"> <li>i) Removable eyebolt type lifting lugs</li> <li>ii) 15mm thick anti vibration rubber pad all throughout base channel</li> <li>iii) Predrilled base channel ISMC – 100 or equivalent for all sides</li> <li>iv) Foundation bolts</li> <li>v) Stainless steel buff-finished 2mm thick plate for all sides</li> <li>vi) Stainless steel scratch strips along desk edges and kick plate for panels fixed with pan-head recessed screws</li> <li>vii) Rubber strips to ensure air-tightness between kick plate and finished floor</li> </ul>
25	Name plates	:	For all instruments and accessories except those having integral service engraving
26	Name plate material	:	Laminated phenolic (3 layers)

- |    |                             |   |   |
|----|-----------------------------|---|---|
| 27 | Fixing of name plates       | : | Stainless steel pan head screws   |
| 28 | Lettering                   | : | Black with white engraved   |
| 29 | Mounting of terminal blocks | : | Vertical angle support bracket tack welded on heat steel plate, screwed on integral wall of enclosure |
| 30 | Illumination fixture        | : | Mounting bracket at the top for two CFL fixture   |

### **Internals Wiring**

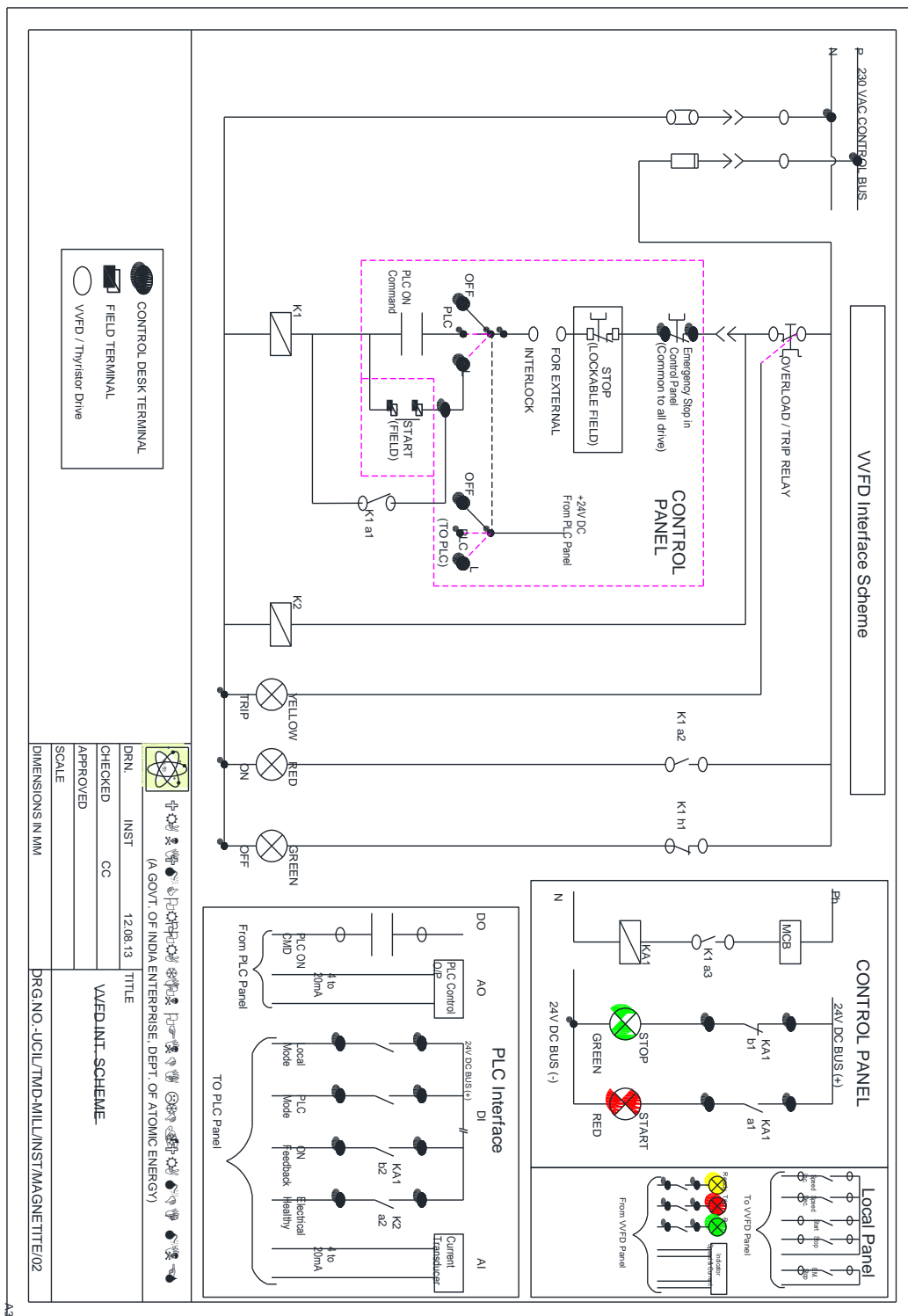
- |   |                 |   |  |
|---|-----------------|---|--|
| 1 | Wiring standard | : | NEC and NEMA   |
| 2 | Wiring material | : | i) Cross link polyethylene/PVC insulated tinned copper, stranded conductor or switch board wire for all high level signal wiring<br><br>ii) Wiring to door mounted devices provided with 49 strands (minimum) and adequate loop lengths of hinge wire to be maintained to prevent excessive fatigue due to multiple door openings                                  |
| 3 | Wire sizes      | : | i) Control switch wiring – 16 AWG<br><br>ii) Ammeter Circuits – 12 AWG<br><br>iii) Indicating lamps and push buttons – 16 AWG<br><br>iv) Annunciation – AWG<br><br>v) Interlocking- 16 AWG<br><br>vi) Power supplies – 2mm <sup>2</sup><br><br>vii) Control systems – to suit requirement<br><br>viii) Transmitted signals – 16 AWG<br><br>ix) All others – 12 AWG |
| 4 | Wire Color      | : | All AC (phase & Neutral) supply, DC (positive and negative), Control supply and signal cable shall have different colour for easy identification.  |



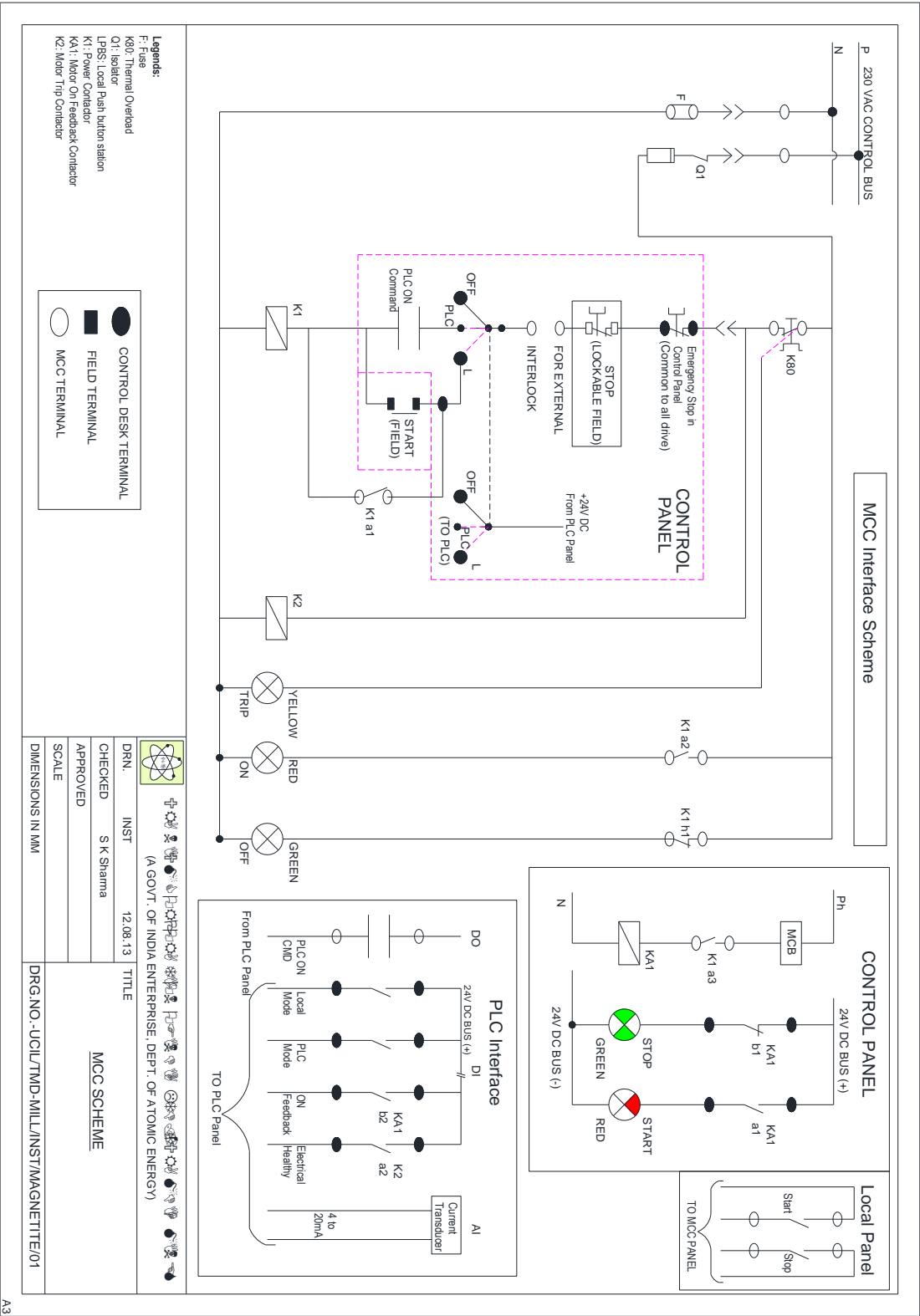
4	Dressing	:	<ul style="list-style-type: none"> <li>i) Internal wiring shall be grouped so that all outgoing wiring to each particular remote location is terminated on adjacent terminal blocks</li> <li>ii) All low level signal cables shall be separately bundled from control cable and maintained at 300mm minimum spacing from control bundles</li> <li>iii) Wiring shall be arranged to ensure free access to all instruments or devices necessary for adequate maintenance services</li> <li>iv) No wiring shall be routed across the face or rear of any device, which will restrict the opening of covers or obstruct access to leads, terminals or devices</li> <li>v) Tapping or splicing between terminal points is not permissible</li> <li>vi) Interior wiring and jump rings shall be arranged so that external corrections can be made from internal side of terminal blocks</li> <li>vii) Common connections limited to 2 (two) wires per terminal</li> <li>viii) Groups of wires shall be bunched with cable straps(lockable unlock able type) provided at frequent intervals</li> </ul>
5	Running of Wire	:	Suitably grouped wires placed in polyethylene wiring tray with clam on type covers
6	Terminal Lug	:	Compression, Insulated Sleeve, ring tongue type.
7	Identification	:	Wire number of each termination shall be by means of cross ferrules (printed on PVC tube)
8	Internal Lighting	:	Switch fuse unit for lighting supply separated from instrument power supply isolator are mounted inside the cabinet in each access door
9	Maximum Allowable Supply Voltage	:	220 Volt
10	Power Supply Isolation	:	MCB for individual instruments

## Interface Diagram

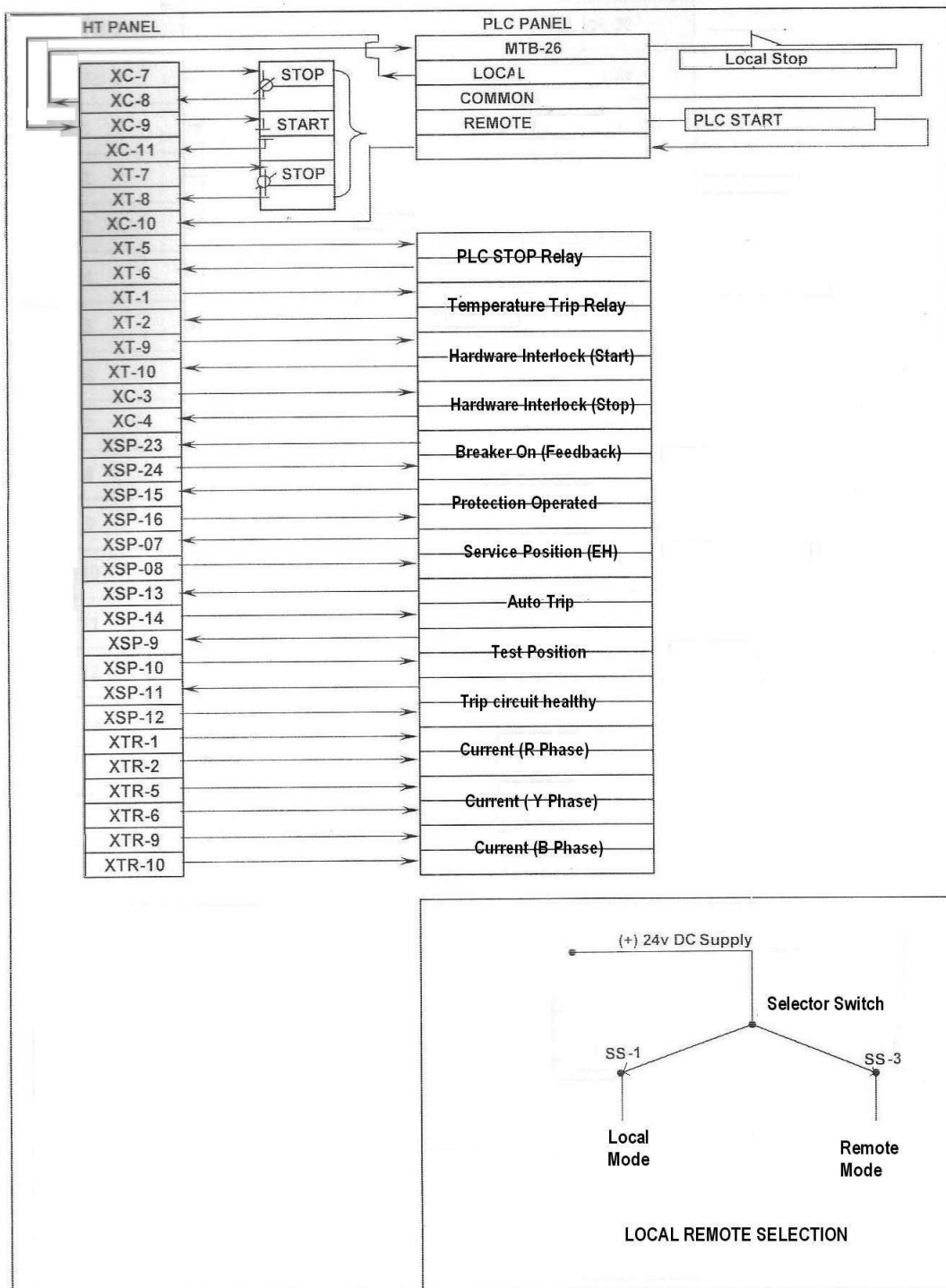
### 1.6.1 VVFD Interface Scheme



1.6.2 MCC Interface Scheme



### 1.6.3 HT Drive Interface Scheme



## **1.7    Approved Make:**

### **1.7.1    Field Instruments (Pressure Tx, Level Tx, Magnetic flow meters)**

- 1.7.1.1    Siemens
- 1.7.1.2    Honeywell
- 1.7.1.3    Krone Marshall
- 1.7.1.4    Endress & Houser
- 1.7.1.5    ABB

### **1.7.2    Field Instruments (Pressure/Flow/Temperature Switches & Gauges)**

- 1.7.2.1    WIKA
- 1.7.2.2    SWITZER**
- 1.7.2.3    Forbes Marshall**

### **1.7.3    Saunders Type Control Valve / ON OFF Valve**

- 1.7.3.1    Crane
- 1.7.3.2    BDK
- 1.7.3.3    Procon
- 1.7.3.4    RK Valve

### **1.7.4    ON/OFF Knife Gate Valve**

- 1.7.4.1    Orbinox
- 1.7.4.2    VAAS
- 1.7.4.3    Flsmidth
- 1.7.4.4    TYCO
- 1.7.4.5    Larox
- 1.7.4.6    Weir Minerals

### **1.7.5    RTD**

- 1.7.5.1    Pyrotech
- 1.7.5.2    Asiatic
- 1.7.5.3    Japsin
- 1.7.5.4    L & T
- 1.7.5.5    Toshniwal

### **1.7.6    Solenoid Valve**

- 1.7.6.1    ASCO Numatics
- 1.7.6.2    GEMU
- 1.7.6.3    Burket
- 1.7.6.4    Rexroth

### **1.7.7    FUSES**

- 1.7.7.1    BUSSMANN
- 1.7.7.2    Siemens
- 1.7.7.3    Rockwell automation
- 1.7.7.4    Telemechanics

### **1.7.8 CONTROL PANELS**

- 1.7.8.1 Rittal, Bangalore
- 1.7.8.2 Pyrotech, Udaypur

### **1.7.9 INDICATING LAMPS (LED TYPE)**

- 1.7.9.1 Binay
- 1.7.9.2 Bharatiya Cutler-Hammer,
- 1.7.9.3 Telemechanics
- 1.7.9.4 EAO
- 1.7.9.5 Siemens,
- 1.7.9.6 L&T
- 1.7.9.7 TECHNIK

**SECTION - IV**  
**PERFORMANCE GUARANTEE & TESTS**

**SPECIFICATION NO.MBM-01**  
**FOR**  
**MAGNETITE BALL MILL SYSTEM**  
**SECTION - IV**  
**PERFORMANCE GUARANTEE & TESTS**

**1.00.00 GUARANTEE AND TEST CONDITIONS**

**1.01.00 Statement of Guarantee**

The Contractor shall guarantee that the system supplied by him or his sub-vendors under this contract will operate properly and efficiently and that the plant will attain all output and energy figures stipulated in the contract. The plant supplied under this contract shall be subjected to testing to ensure that the Performance Guarantees are met.

The Contractor shall also guarantee that all materials and manufacturing methods used in the construction of machinery and plant supplied under the subject package shall be of best grade and this guarantee shall make it obligatory for the Contractor to make good or replace defective parts, as soon as possible, free of charge. The acceptance of the plant shall be subject to satisfying all relevant guarantee requirements/stipulations by the Contractor.

**1.02.00 Performance Tests**

Immediately after satisfactory "Completion of Commissioning", the plant/section shall be subjected to the "Test on Completion" i.e. Performance Guarantee Tests.

The tests shall be performed within 15 days after commissioning of the plant or any individual system. All relevant procedural details of the tests will be discussed and agreed at the time of award of Contract. However, the plant/s, during the tests, shall be operated normally, as per Contractor's written operating instructions by the Purchaser's operating staff under direct supervision and completion responsibility of the Contractor.

Before the start of the tests, details of the test, section/system to be tested, their dates for execution, organisation of labour and other requisite materials, course of work and the right and obligation of the contractor and the Purchaser during the test period shall be stated and furnished by the Contractor in a programme to be agreed upon and approved by the Purchaser.

For proof of the guaranteed figures, the measuring and control devices installed in the plant shall be used. Before the tests, the measuring instruments



shall be checked for accuracy, calibrated and sealed. After completion of the test, the said instruments shall again be checked for accuracy. Any other portable measuring and control devices, if required to prove the guarantee figures, shall be arranged by the Contractor at no extra cost to the Purchaser and subject to acceptance of the same by the Engineer prior to the test.

During the Performance Tests, the entire plant with all the equipment therein shall be closely monitored by the Engineer and the observations shall be noted for subsequent appropriate action by the Contractor.

#### 1.03.00 **Non-fulfillment of Performance Guarantee and Repeat Test**

In case the Contractor fails to prove the performance guarantees set out in the contract, he will be entitled to an additional period of Sixty (60) days, counted from the date of completion of the unsuccessful Performance Test, during which he shall, at his expense and risk and with the approval of the Purchaser, carry out with due expediency the necessary rectification, replacements and/or modifications and shall execute an additional Performance Guarantee Test. During this period, the Contractor shall retain his supervisory and other personnel at the site at his own cost.

In order to mitigate such damages, the Contractor shall make best endeavor to carry out the required rectifications, replacements and/or modifications etc. and repeat the Performance Test in the shortest possible time. In default, the Purchaser, will have the right, within his own capabilities, make the aforesaid rectifications/modifications etc. and to carry out the repeat Performance Tests in lieu of the Contractor, or to entrust a third party to execute the same at the Contractor's expenses and risk.

#### 1.04.00 **Performance Guarantees of Magnetite Ball Mill**

The various guarantee figures, those shall have to be met by the Contractor in the Performance Guarantee Tests, have been stipulated in the following clauses.

The total duration of interruptions/stoppages, for reasons answerable by or within the control of the Contractor shall be less than 10% of the respective total test period specified for that particular plant/system.

- |     |                       |   |  |
|-----|-----------------------|---|--|
| i)  | Guaranteed throughput | : | Rated capacity in Metric ton per hour for Magnetite Ball Mill given by the Bidder. |
| ii) | Product size          | : | 90% below 53 microns $\pm$ 5 microns   |

Max. Grain size: 63 microns.

iii) Duration of test (Mill feeding)	3 Day continuous and uninterrupted run of the system
--------------------------------------	--

Under the following conditions:

i) Feed size	80% (-) 125 micron 100% (-) 200 micron
ii) Average Work Index	17.2 KWH/T (See relevant note below).

- The grinding circuit shall be considered as MAGNETITE BY-PRODUCT RECOVER PLANT. Neutralized slurry is passed through magnetic drum separator .The concentrate produced will be further processed in grinding mill and the final product will be overflow of Hydro cyclone slurry.
- A single test period of 3 day and uninterrupted operation averaging not less than rated capacity given by the bidder in metric ton per hour of Magnetite shall be required to prove the guarantee.
- During the test period, mill feeds shall be separately sampled by an agreed methodology to obtain samples of both feed and product being representative of the 3 day period.
- The hydrocyclone overflow products shall be sampled for 72 hour composite samples shall be measured for pulp density and sieve analysis by standard sieving method. From the results of these sieve analysis, the d80 of the product shall be determined graphically.
- The mill feed d80 shall be assumed to be that value in the range of 125µ-200µ.
- The Tenderer may furnish in his tender a well-defined performance curve for Mill throughput Vs. Wi keeping the product size as constant properly backed up by formula which shall be discussed in details and if found acceptable to the Purchaser and at the sole discretion of the Purchaser, may be considered as the basis for determining the required guaranteed throughput at test conditions.
- The power transmission efficiency factor i.e. power at motor shaft to power at mill pinion shaft shall be previously stated by the party at the time of contract award.

For the test to be successful, the plant shall produce each Hydrocyclone classifier overflow product at a determined d90 of 53 microns  $\pm$  5 microns.

UCIL is looking for a Magnetite ball mill of 7' diameter and 15' long which will give a Design capacity of 11 TPH with the given feed size of 80% passing -125 mesh and the product should have the following size fractions

90% passing 300 mesh B.S.S.

100% passing 240 mesh

**SECTION - V**  
**PROPOSAL EXHIBIT SHEETS**

**C O N T E N T S**

SCHEDULE I	:	GUARANTEED PERFORMANCE DATA AND OTHER PERTINENT INFORMATION
SCHEDULE II	:	EQUIPMENT DATA SHEETS
SCHEDULE III	:	DEVIATIONS
SCHEDULE IV	:	SCHEDULE OF PRICES & MISC. COMMERCIAL PARTICULARS
SCHEDULE V	:	SPARE PARTS

## **SECTION-IV: PROPOSAL EXHIBIT SHEETS**

### **1.00.00 INSTRUCTIONS TO TENDERER**

The Tenderer shall fill-in all the technical information and other data asked for in the enclosed schedules and submit the same along with his proposal.

The equipment data sheets should be properly filled-in. Phrases like "To be furnished later" shall be avoided and may even nullify the bid. Data which cannot be made definitive at offer stage may be marked with asterisk (\*) but every care should be taken to furnish all data/information asked for.

The information sought out in the proposal exhibit sheets provided hereinafter shall be furnished only in the format specified and at the appropriate spaces allocated. These must be properly authenticated by the Tenderer as verification of the data submitted. The signed pages with Seal of the Company, in their entirety, shall be returned with and shall be an essential part of the Tenderer's original proposal unless otherwise stated specifically in the Schedule of Proposal Exhibit Sheets. Other copies of the Proposal shall contain Xerox copies of these sheets duly filled in.

Failure to comply strictly with the above requirements may, as indicated earlier, result in total rejection of the Proposal.

**SECTION - V**  
**PROPOSAL EXHIBIT SHEETS**  
**SCHEDULE - I**  
**GUARANTEED PERFORMANCE DATA**  
**OTHER PERTINENT INFORMATION**

## **GUARANTEED PERFORMANCE DATA AND OTHER PERTINENT INFORMATION**

The Tenderer shall furnish some important parameters/data, on the plant and equipment offered, under the specified operating conditions as per the following format :

### **1.00 MAGNETITE BALL MILL**

#### **1.01 Guaranteed Performance data:**

- i) Average capacity :
- ii) Design capacity (Dry T/hr.) :
- iii) Design work index (KWH/T) :
- iv) Guaranteed product size (mm)
  - 80% passing :
  - 100% passing :

#### **1.02 Major equipment Sizes :**

- i) Ball mill size (mm x mm dia) :
- ii) Hydrocyclone Size & make :

#### **1.03 Requirement of utilities:**

- i) Water :
  - Industrial water for make-up:  
(m<sup>3</sup>/day)
  - Cooling Water (m<sup>3</sup>/hr.) :
- ii) Air
  - Service Air (Nm<sup>3</sup>/hr.) :
  - Instrument Air (Nm<sup>3</sup>/hr.) :
- iii) Electrical power (KW) :
  - for illumination :  
(240V, 1 ph, 50 Hz.)
  - at LT (415 Volt, 3 ph, 50Hz):
  - at HT (6.6 KV, 3 ph, 50Hz.) :

iv) Consumables :

- Wear resistant Rubber Liner (T/year) :
- Grinding media (T/year) :
- Lubricant ( $\text{m}^3/\text{year}$ ) :
- Others (if any) :



**SECTION - V**  
**PROPOSAL EXHIBIT SHEETS**  
**SCHEDULE – II/A**  
**EQUIPMENT DATA SHEETS**

### MAGNETITE BALL MILL

SUBJECT	DESCRIPTION (UNIT)	BALL MILL	
		SPECIFIED	OFFERED
Feed	o Material	Magnetite Drum Concentrate after Hydro cyclone classification	
	o Particle size (mm)		
	- 80% passing		
	Magnetite	125 $\mu$	
	Uranium Ore	75 $\mu$	
	o Bulk density (t/cum)	1.6(Uranium ore) 2.05(Magnetite)	
	o Specific Gravity	2.8(Uranium ore) 5.15(Magnetite)	
	o Grinding Index (Kwh/t)		
	- Design	17.2 for Magnetite & 11 for ore	
Product	o Particle Size (micron)		

	- 90% passing	53 $\mu$ $\pm$ 5	
General	o Number	1	
	o Type of grinding circuit	Wet Overflow Ball Mill	
	Material to be ground	Magnetite concentrate + Uranium Ore (combined)	
	o Throughput (dry tph) passing through, the mill at rated feed	11 TPH	
	Magnetite	6.6 TPH	
	Uranium Ore	4.4 TPH	
	- At max. recirculation load (400%)		
	o Specific power consumption at design value of Grinding Index (kwh/Dry T)		

	o Total Power consumption (KW)		
	o Slurry concentration inside mills (% WW) at design condition		

	o Design Mill Speed		
	- RPM		
	- In % of critical speed		
Shell	o Diameter inside shell liner (mm)		
	o Shell length inside liner (mm)		
	o Shell thickness (mm)		
	o Material standard		
	o Rotating weight (without grinding media) (Kg)		
	o Distance between bearing axes (mm)		
	o Number, location and size of manholes		

Lining	o Mill shell		
	- Make / Type	Tega	
	- Material standard	Rubber	
	- Thickness (mm)		
	- Fixing details		
	- Total weight (kg)		

	o Mill heads		
	- Make / Type	Tega	
	- Material standard	Rubber	
	- Thickness (mm)		
	- Fixing details		
	- Total weight (kg)		
Feed Chute	o Material		
	o Thickness (mm)	8 (min)	

Grinding media	o Material		
	o Hardness (BHN)		
	o Design charge factor(%)		
	o Size		
	o Total charge weight(Kg)		
Inlet Face Lining	o Material		
	o Thickness (mm)		
Mill Head	o Material standard		
	o Thickness (mm)		
	o Method of attachment to shell	Bolted	
Trunions	o Material		
	o Size (mm)		

	o Method of lubrication		
	o Centre distance between feed and discharge ends		

Mill Discharge Arrangement	o Type / System		
	o Trommel screen		
	- Diameter x Length		
	- Size of opening		
	- Material of screen		
Bearings	o Make / Type	Self Aligning	
	o Diameter/Width (mm/mm)		
	o Bearing material		
	o Seal material		
	o High pressure pre-jacking system (Yes / No )		

	o Lubrication system details		
	o Details of power requirement (KW) for lubrication		
	o Compressed air required		
	o Cooling		
	- Type		
	- Water requirement (m <sup>3</sup> /hr)		
Drive Pinion	o No. of pinions		
	o Bearing type & size		
	o Material of pinion		
	o No. of teeth, module and pressure angle		
	o Details of heat treatment/hardness		

Pinion shaft	o Diameter & length of the shaft (mm)		
--------------	---------------------------------------	--	--



	o Material standard		
	o Bearing		
	- Type of bearing		
	- No. of bearing/shaft		
	o Shaft pinion reversible (Yes / No)	Yes	
Girth gear	o Material and heat treatment		
	o No. of teeth, module, pressure angle		
	o Girth gear segments Reversible (Yes/No)	Yes	
	o Method of mounting		
	o Method of lubrication		
Drive Motor	o Main Drive		
	- Type	Slip ring	

	- Class of protection	IP-55	
	- Rating (KW)/Voltage(V)	6.6 KV, 3 ph	
	- Insulation class	F	
	- Speed (rpm)		

	o Auxiliary Drive		
	- Type	TEFC	
	- Class of protection	IP-55	
	- Rating (KW)/Voltage(V)	415V, 3 ph	
	- Insulation class	B	
	- Speed (rpm)		

Gear Box	o Main gearbox		
	- Type		
	- Make	Siemens/Premier Transmission	
	- Rating (kw)		
	- Material standard of housing		
	- Wall thickness		
	- Pinion / Gear material standard		
	- Heat treatment/ hardness		
	- Design code/Service factor		
	- Reduction ratio		
	o Auxiliary gearbox		
	- Type		

	- Make	Siemens/Premier Transmission	
	- Rating (kw)		
	- Design code/Service factor		
	- Reduction ratio		
	- Lubrication		

	o Lubrication system for main gearbox		
	- Type		
	- Type of oil circulation pump		
	- Standby pump provided (Yes / No)	Yes	
	- Standby oil strainer provided (Yes / No)	Yes	
	- External oil cooler provided (Yes / No)		

	- Cooling water requirement (Cu.m/hr)		
	- Details of safety Interlocks		
	- Pump motor rating(KW)		
Coupling	o Motor / Main Gearbox		
	- Make / Type		
	o Gearbox/Mill Pinion shaft		
	- Make / Type		
	o Motor / Aux. Gearbox		
	- Make / Type		
Clutch	o Type of clutch between aux. & main gearboxes	Self disengaging type jaw clutch	
	o Make		
	o Details of safety interlock		

Weights	o Single heaviest part (Kg) to be handled		

	o Total weight of everything furnished under this data sheet (Kg)		
Safety Devices	o Details		
Additional	Whether the following items have been furnished		
	- Leaflets & brochures		
	- Dimensional GA dwg.		

#### HDROCYCLONE

SUBJECT	DESCRIPTION (UNIT)		HYDROCYCLONE	
			SPECIFIED	OFFERED
Qty.	o	Total	Four	
	o	Operating	one	
Equipment. Name	o		Magnetite concentrate Cyclone	
Location			Neutralization area	
Feed Slurry at rated condition	o	Material	Ground Magnetite concentrate	

	o	Slurry concentration (% w/w)	49%	
	o	Solid size distribution (micron)		
		- 80% passing	150	
		- 100% passing	200	

	o	Sp. Gravity of solid	2.8 & 5.15	
	o	Liquid	Water	
	o	pH of slurry	Acidic	
	o	Quantity (Dry T/h)		
	o	Pressure (MWC)		
Overflow at rated condition	o	Slurry concentration (% w/w)	20--25	
	o	Solid size distribution (micron)		
		- 80% passing		

		- 100% passing	55	
	o	Quantity (Dry T/h)		
	o	Pressure (MWC)		
Under flow at rated condition	o	Slurry concentration (% w/w)	80	
	o	Size distribution (micron)		
		- 80% passing		
		- 100% passing		
		- d60 / d10		
	o	Quantity (Dry T/h)		



**SECTION-IV**

**PROPOSAL EXHIBIT SHEETS**

**SCHEDULE-INB**

**EQUIPMENT DATA SHEETS – ELECTRICAL**

**SECTION : V**  
**PROPOSAL EXHIBIT SHEETS**

**SCHEDULE : II/B**

**DATA SHEETS : ELECTRICAL**

.....  
Tenderer's Name

## A. A. C. MOTOR

- NOTE: 1. The Tenderer must submit along with the Bid atleast those data which are marked with asterisk (\*) for all HT motors and for LT motors of rating 75kW and above.
2. After award of contract, the successful Tenderer shall resubmit completely filled in datasheets for all HT and LT motors.

### 1.0 GENERAL

1.1 Application\* :

1.2 Quantity\* :

1.3 Make\* :

1.4 Frame Size :

1.5 Applicable Standard\* :

### 2.0 TYPE AND RATING

2.1 Tyoe of Motor\*

2.2 Service\*

2.3 Duty Cycle/Designation\*

2.4 Rated Continuous Output

a) At 40 deg.C ambient kW :

b) At 50 deg.C ambient kW\* :

2.5 Rated Speed\* r.p.m. :

2.6 Rated Voltage & % variation\* :

2.7 Rated Frequency & % variation\*

2.8 Full load current\*

2.9 No load current

2.10 Rated Power Factor\*

2.11 For slip-ring motor :

a) Rotor voltage in Volts\* :

b) Rotor current in Amps\* :

2.12 Efficiency at rated voltage and Frequency :

a) Full Load\* % :

b)  $\frac{3}{4}$  load % :

c)  $\frac{1}{2}$  load % :

### 3.0 PERFORMANCE

3.1 Method of Starting\* :

- 3.2 Starting Current at rated Voltage\* % f.l.c. :
- 3.3 Starting Torque at rated Voltage\* kg.m :
- a) Pull out torque :
- b) Breakway torque :
- 3.4 Starting time at : 80% voltage 100% voltage
- a) With load\* sec. :
- b) Without load (driven Equipment coupled) sec. :
- 3.5 Safe stall time at 110% rated voltage:
- a) Hot condition \* sec. :
- b) Cold condition sec. :
- 4.0 CONSTRUCTION
- 4.1 Degree of Protection of Enclosure\* :
- 4.2 Method of Cooling\* :
- 4.3 Insulation Class\*

- For Stator :
- For Rotor :
- 4.4 Temperature Rise Over 50 deg.C  
Ambient (by resistance)\* :
- 4.5 Tropicalised\* Yes/No :
- 4.6 Winding Connection\* :
- 4.7 Bearings : D.E. N.D.E.
- a) Make :
- b) Type :
- c) Recommended lubricant :
- 4.8 Motor Terminal Box
- a) Type :
- b) Fault withstand :
- i) Current kA :
- ii) Time Sec. :
- 4.9 Whether slip-ring brush continuously  
rated or provided with lifting arrangement :

## 5.0 ACCESSORIES

### 5.1 Space Heaters

a) No. x Watt\* :

b) Volt, phase, frequency :

### 5.2 Winding temperature detector\*

a) Type :

b) Nos. furnished :

### 5.3 Bearing temperature detector\*

a) Type :

b) Nos. furnished :

### 5.4 Temperature Indicator\*

a) Type :

b) Nos. furnished :

c) Locations :

### 5.5 Temperature Alarm Contact

a) Nos. provided :

	b) Locations	:
	c) Contact rating	:
5.6	Flow switch	
	a) Type	:
	b) Nos. provided	:
	c) Locations	:
	d) Contact Rating	:
5.7	Accessory Terminal Box	
	a) Nos. provid	
6.0	GROUNDING	
6.1	No. of grounding pads provided*	
	a) On motor body	:
	b) On terminal box	:
7.0	MISCELLANEOUS	
7.1	Type of mounting	:
7.2	Overall dimension (L x B x H)      mm x mm x mm	: :
7.3	Moment of Inertia (GD Sq.)	
	a) Stator      kg.sq.m.	:
	b) Rotor      kg.sq.m	:



c) Total kg.sq.m :

#### 7.4 Weight

a) Stator kg :

b) Rotor kg :

c) `Total kg :

### B. ROTOR STARTER

- NOTE: 1. The Tenderer must submit along with the Bid atleast those data which are marked with asterisk (\*).
2. After award of contract, the successful Tenderer shall resubmit completely filled in datasheets.

		:	Air	Oil immersed	Liquid
			Cooled grid	Rotor Starter	

Rotor Starter

1.0 Make\* :

2.0 Type\* :

3.0 Voltage Rating\* (Volts) :

4.0 Currents Rating\* (Amps) :

1.0 Rated Power\* (KW) :

6.0 Value of total starting Resistance (Ohms) :

7.0 Value of Resistance at each step :

8.0 Time for cutting each step :

9.0 Total time for cutting the resistance :

10.0 Whether manual handwheel Provided\* Yes/No :

11.0 Whether liquid/oil level switch Provided\* Yes/No :

12.0 Whether high temperature  
Alarm/trip provided\* Yes/No :

13.0 Detail of Pilot Motor

13.1 Voltage (Volts)

13.2 No. of phase :

Liquid Air Oil immersed

Rotor Starter Cooled grid Rotor Starter

13.3 kW rating :

13.4 Whether provision for local  
Operation provided Yes/No :

13.5 Whether provision for tripping made  
in case of maloperation Yes/No :

13.6 Whether limit switches in end  
Provision provided Yes/No :

#### C. RESISTANCE UNIT

1.0 Material of resistance element\* :

2.0 Temp. co-effocient of element :

3.0 Specific resistance of element :

4.0 Element type\* :

1.0 Max. temp. rise of element/oil/liquid\* :

6.0 Method of cooling\*

7.0 Insulation material :

8.0 Type of electrolyte :

9.0 Strength of electrolyte :

10.0 Material of moving blade :

#### D. \*GENERAL

1.0 Weight of each starter :

2.0 Overall dimension

(Length x Breadth x Height) :

### C. MCC, ACDB, DCDB AND LOCAL PUSHBUTTON STATION

- NOTE:
1. The Tenderer must submit along with the Bid atleast those data which are marked with asterisk (\*).
  2. After award of contract, the successful Tenderer shall resubmit completely filled in datasheets.

#### 1.0 MCC/DB ASSEMBLY

1.1 Make\* :

1.2 Type\* :

1.3 Reference Standard\* :

1.4 Voltage (Nom./Max.)\* :

1.5 Phase, Frequency\* :

1.6 Short Circuit Rating\*

a) Interrupting Symmetrical kA :

b) Short time for 1 sec. kA rms :

1.7 Insulation Level\*

1-min., 50 Hz Voltage

withstand kV rms :

1.8 Construction\*

a) Metal clad, air insulated  
Floor mounting Yes/No:

1.9 Enclosure\*

a) Degree of Protection :

b) Minimum thickness of sheet  
Metal mm:

#### 2.0 CONSTRUCTION

- 2.1 Design\*
- a) Completely compartmentalised :
- b) Working height limits from floor level mm :
- 2.2 Control Compartment\*
- a) Provided with individual front access door :
- 2.3 MCC/DB section provided with\*
- a) Removable back cover :
- b) Full height cable chamber :
- 2.4 Horizontal wireway for inter panel wiring provided for each MCC/DB\* :
- 2.5 All meters, relays, lamps etc. flush mounted type\* :
- 2.6 Vertical Section Size
- a) MCC (L x D x M) mm :
- b) DB (L x D x H) mm :
- 3.0 BUSBAR
- 3.1 Make :
- 3.2 Material & Grade :
- 3.3 Reference Standard :

- 3.4 Continuous currents at site condition,  
50 deg.C. ambient and within cubicle
- a) Main Busbar \* Amp :
- b) Vertical busbar (minimum) :
- 3.5 Conductor Section
- a) Main Basbar sq.mm :
- b) Vertical Busbar sq.mm :
- 3.6 Max. temp. rise over 50 deg.C  
Ambient\* deg.C :
- 3.7 Short-time current for  
1 second\* KA rms :
- 3.8 Phase barrier/shrouding provided for\*
- a) Main Busbar :
- b) Vertical Busbar :
- 3.9 Bus Connections
- a) Silver plated :
- b) Provided with anti-oxide grease :
- c) Bimetallic connectors between  
Dissimilar metals :
- 3.10 Minimum clearance of bare busbar  
and connection :
- a) Phase to phase \* mm :
- b) Phase to ground\* mm :
- 3.11 Busbar support spacing mm :

3.12 Busbars colour coded Yes/No :

3.13 Bus Support Insulator

a) Make :

b) Type :

c) Reference Standard :

d) Voltage Class :

e) Min. Creepage Distance :

f) Cantilever Strength Kg/sq.cm :

g) Net Weight Kg :

4.0 CONTROL MODULE

4.1 Control Modules\*

a) Fixed type for MCCs Yes/No :

b) Fixed type for DBs Yes/No :

4.2 Module sizes (L x D x H)\*

a) Incomer with

630 A Switch mm :

400 A Switch mm :

200 A Switch mm :

b) Outgoing feeder with

100 A Switch fuse mm :

63 A Switch fuse mm :

16 A Switch fuse          mm          :

c) Starter units with

300 A Starter                  mm          :

160 A Starter                  mm          :

63 A Starter                  mm          :

32 A Starter                  mm          :

16 A Starter                  mm          :

16 A Starter

reversible                  mm          :

4.3 Spare Module\*

a) Fully-furnished Spare Module  
Provided as per

specification? Yes/No          :

5.0 M.C.C.B

5.1 Make                          :

5.2 Type                          :

5.3 Reference Standard          :

5.4 Rated Voltage                  KV          :

5.5 Rated Frequency              Kz          :

5.6 No. of Poles                  No.          :

5.7 Rated Currents

a) Continuous (at site condition  
50 Deg.C ambient & within

cubicle)                          Amp          :

b) Short-time Current for



1 second KA rms :

5.8 Max. temp. rise over 50 deg.C

Ambient deg.C :

5.9 Rated Operating Duty :

5.10 Interrupting Capacity at rated  
Voltage and operating duty

a) Symmetrical kA rms :

b) Asymmetrical kA rms :

5.11 Rated Making Current kA peak :

5.12 Insulation Level

a) 1 min 50 Hz withstand kV rms :

5.13 Operating Mechanism

a) Type :

b) Trip free or fixed trip :

5.14 M.C.C.B. provided with

a) Mechanical safety interlock :

b) Manual operating handle :

- c) Emergency manual trip :
- d) Mechanical ON-OFF indications :
- e) Overload release :
- f) Shortcircuit release :
- g) Auxiliary switch -  
Type & Rating :

#### 5.15 Range of release

- a) Overload :
- b) Short Circuit :

### 6.0 SWITCHES

- 6.1 Make\* :
- 6.2 Type\* :
- 6.3 Reference Standard\* :
- 6.4 Switch furnished with
  - a) Operating handle
  - b) Door interlock :

- b) Provision for padlocking in  
ON & OFF Positions :
- 6.5 All feeders provided with bolted  
Disconnect link? :
- 6.6 Current Ratings at 50 Deg.C
- (a) :
- (b) :
- (c) :
- (d) :
- (f) :
- 6.7 Breaking current at 415V A.C.  
Or 110V D.C.
- a) :
- b) :
- c) :
- d) :
- e) :

7.0	FUSE		
7.1	Make*	:	
7.2	Type*	:	
7.3	Reference Standard*	:	
7.4	Rupturing capacity *	KA rms (sym)	:
7.5	Continuous current at 50 deg.C Ambient & within cubicle	:	
7.6	Cut-off currents	KA peak	:
7.7	Fuse characteristics furnished For various fuse ratings	:	
8.0	CONTACTORS		
8.1	Make*	:	
8.2	Type*	:	
8.3	Reference standard*	:	
8.4	Duty class*	:	
8.5	Utilization category*	:	

8.6 Operating Coil Voltage

a) Rated\* :

b) Pick-up :

c) Drop-out :

8.7 Continuous Current rating & 50  
Deg.C & within cubicle A :

8.8 Power Consumption

a) During closing VA :

b) After closing VA :

8.9 Auxiliary Contacts  
Furnished per Contactor

a) Normally open (NO) :

b) Normally closed (NC) :

8.10 Aux. Contact rating

a) Make & Continuous Amp :

b) Break (inductive) at

240V A.C.                      Amp                      :

110V A.C.                      Amp                      :

8.11    Time range of delayed dropout  
         Contctors furnished                      Sec                      :

8.12    Thermal Overload Relay &  
         Single Phase Preventor

a)    Temperature compensted\*                      :

b)    Hand Reset ?\*                      :

c)    No. & type of contacts                      :

d)    Thermal overload characteristics  
         Furnished?                      :

9.0    PUSHBUTTON & LAMPS

9.1    Push Button

a)    Make\*

b)    Type\*                      :

c)    Cat. No.\*                      :

d) Contact Rating

Make & Continuous                      Amp :

Break (inductive)                      Amp :

240V A.C.                      :

110V D.C.                      :

9.1      Lamps

a) Make\*                      :

b) Type\*                      :

c) Cat. No.\*                      :

d) Watts/Voltage\*                      :

e) Lamp & lens replaceable  
from front?                      :

10.0      METER

10.1      Make\*

10.2      Type\*                      :

10.3 Reference standard\*

10.4 Size\*

10.5 Scale\*

10.6 Accuracy class\* :

11.0 CURRENT TRANSFORMER

11.1 Make\* :

11.2 Type\* :

11.3 Reference Standard\* :

11.4 C.T. Ratings

a) Current ratio :

b) Rated burden\* :

c) Accuracy class\*

Protection :

Metering :



12.0 SECONDARY WIRING

12.1 Type of Insulation :

12.2 Voltage Grade :

12.3 Conductor material :

12.4 Conductor size (minimum)

a) Potential Circuit sq.mm :

b) Current & control  
Circuit sq.mm :

12.5 Wires identified at both ends  
with ferrules :

13.0 TERMINAL BLOCK

13.1 Make\* :

13.2 Type\* :

13.3 Cat. No. :

13.4 Voltage Grade :

13.5 20% spare terminals furnished? :

#### 14.0 BUS DUCT CONNECTION

14.1 Bus duct connection included :

14.2 Avrage length assumed for bus duct :

#### 15.0 CABLE TERMINATION

15.1 Cable entry provision from top  
& bottom :

15.2 Cable termination & connection  
Arrangement furnished as specified

15.3 Power Cable Lugs\*

a) Type :

b) Material

15.4 Power Cable Glands\*

a) Make :

b) Type :

c) Materials :

d) With tapered washers :

15.5 Removable Gland Plate

a) Material for multicore cable :

b) Material fo I/C cable :

c) Thickness of the plate :

16.0 GROUND BUS\*

16.1 Ground bus furnished ? :

16.2 Material :

16.3 Size :

17.0 NAME PLATE

17.1 Material :

17.2 Thickness :

17.3 Size :

18.0 SPACE HEATER\*

18.1 Cubicle Heater

a) Thermostat controlled :

b) Wattage :

c) Voltage :

18.2 Provision made for motor  
Heater supply :

18.3 Cubicle/Motor heater provided with  
Individual switch fuse units :

#### 19.0 LOCAL PUSHBUTTON STATION

19.1 Make\* :

19.2 Type\* :

19.3 Enclosure\* :

19.4 Degree of protection\* :

19.5 Local Control Station enclosure  
Furnished with

a) Inscription plate :

b) Knockout for cable/circuit  
Entry

Tenderer's Name

### 19.6 Contacts of each push button

- a) Number furnished

- b) Current rating

## Make & Continuous

Beak (inductive)

19.7 Stop P.B. having provision of locking in lockout position\*

## 20.0 D.C. DIST. BOARD

- 20.1 Make\* :

- 20.2 Type\* :

- 20.3 Enclosure\* :

- 20.4 Degree of protection\* :

- 20.5 Dist. Board furnished with all  
Materials & accessories :

## 21.0 TROPICAL POTECTION

- a) Any special treatment for

tropical protection

b) Screens are of corrosion resistant :

## 22.0 PAINTING\*

Finish of MCC/DB

a) Inside

b) Outside

## 23. OVERALL DIMENSIONS & WIGHTS

Name of MCC/DB

Dimensions

Approx.

(L x D x H)

Weights

mm

Kg.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

(Add more sheets, if required)

#### **D. VVVF PANEL**

- NOTE: 1. The Tenderer must submit along with the Bid atleast those data which are marked with asterisk (\*).
2. After award of contract, the successful Tenderer shall resubmit completely filled in datasheets.
3. The following data shall be furnished separately for each type of variable speed drive.

Armature/

Field/

Stator

Rotor



- 1.0 A.C. supply voltage\* :
- 2.0 No. of converters/inverters :
- 3.0 No. of phase per converter/inverters :
- 4.0 Whether full wave fully controlled : Yes/No Yes/No.
- 5.0 Speed control range :
- 6.0 Overload factor \* :
- 7.0 Efficiency at
- a) 100% load\* :
- b) 75% load :
- c) 50% load :
- d) 25% load :
- 8.0 Enclosure protection class\* :
- 9.0 Average ON state current at  
85 deg.C base :
- V
- 10.0 RRM :
- V
- 11.0 DRS :

	V	
12.0	RSM	:
	V	
13.0	DSM	:
14.0	TSM (10 m sec.) Non-repetitive peak ON State current	:
15.0	Thermal Resistance junction/base (deg.C/Watt)	:
16.0	Typical turn ON time	:
17.0	Typical turn OFF time rerlays	:
18.0	Maximum rate of rise on ON State curent (di/dt) Amps//u sec.	:
19.0	Junction operating temperature	:
20.0	Maximum rate of rise of Anode Voltage (dv/dt)	:
21.0	GT to fire	:
22.0	Type of encapsulation	:
23.0	ON State Voltage (VT) at 3 times Average on state current	:

24.0 Forward break over voltage :

25.0 Forward blocking voltage :

26.0 Range of firing angle :

27 Short-time rating

a) 2 hrs. :

b) 1 min. :

## B. TRANSFORMER

1.0 Rating in kVA :

2.0 Voltage :

a) Primary (Volts) :

b) Secondary (Volts) :

3.0 No. of Phases :

4.0 Percentage impedance :

5.0 Type of Cooling :

6.0 Location of Transformer :

## C. ENCLOSURE

1.0 Degree of protection\* :

2.0 Minimum thickness of sheet \*  
metal mm ::

## D. CONSTRUCTION\*

1.0 Completely compartmentalised :

2.0 Working height from floor level :

3.0 Removable back cover provided

4.0 All meters, lamps, window facia  
Annunciation flush/semi-flush  
Mounted :

## E. BUSBAR

1.0 Make:

2.0 Material & Grade :

3.0 Reference Standard

4.0 Continuous current rating :

5.0 Conductor section :

6.0 Max. temp. rise above 50 deg.C  
Ambient :

1.0 Short time current rating for  
1 second :

8.0 Phase to phase clearance :

9.0 Phase to ground clearance :

#### F. INSULATOR

1.0 Make :

2.0 Type :

3.0 Reference Standard :

4.0 Voltage Class :

5.0 Catalogue furnished :

#### G. SWITCH :

1.0 Make :

2.0 Type :

3.0 Reference Standard :

4.0 Catalogue furnished :

H. FUSE :

1.0 Make :

2.0 Type :

3.0 Reference Standard :

4.0 Catalogue furnished :

5.0 Rupturing capacity :

6.0 Fuse characteristics furnished :

## I. CONTACTORS

1.0 Make :

2.0 Type :

3.0 Reference Standard :

4.0 Catalogue furnished :

5.0 Duty class :

6.0 Utilization coil voltage :

7.0 Operating coil voltage :

### 1.1 Rated

7.2 Pick up :

### 7.3 Drop out :

8.0 Auxiliary contacts :

8.1 Normally open :

## 8.2 Normally closed

## J. PUSH BUTTONS

1.0 Make :

2.0 Type :

3.0 Catalogue furnished :

4.0 Contact rating :

## K. LAMPS

1.0 Make :

2.0 Type :

3.0 Catalogue furnished :

4.0 Watts/volts :

5.0 Lamp & lens replaceable from front :

## L. METER

1.0 Make :

2.0 Type :

3.0 Reference standard :

4.0 Catalogue furnished :

5.0 Size :



6.0 Scale :

7.0 Accuracy class :

#### M. SECONDARY WIRING

1.0 Type of insulation :

2.0 Voltage grade :

3.0 Conductor material :

4.0 Conductor size

#### N. TERMINAL BLOCK

1.0 Make :

2.0 Type :

3.0 Reference Standard :

4.0 Catalogue furnished

5.0 Voltage grade :

6.0 20% spare terminal provided ? :

O. CABLE TERMINATION

1.0 Cable entry from top/bottom ? :

2.0 Power cable lugs :

2.1 Type :

2.2 Material :

3.0 Power cable glands :

3.1 Make :

3.2 Type :

3.3 Material :

P. GROUND PLATE :

1.0 Material :

2.0 Size :

Q. NAME PLATE :

1.0 Material :

2.0 Size :

3.0 Thickness :

R. SPACE HEATER

1.0 Separate Switch-Fuse unit provided :

2.0 Provision for supplying  
Motor space heater provided :

3.0 Cubicle heater watt/volt :

4.0 Cubuicle heater thermostatically  
controlled

:

#### **E. P. F. CORRECTION CAPACITOR**

NOTE: 1. The Tenderer must submit along with the Bid atleast those data which are marked with asterisk (\*).

2. After award of contract, the successful Tenderer shall resubmit completely filled in datasheets.

**A. 6.6kV**

1.0 GENERAL

1.1 Make\* :

1.2 Type\* :

1.3 Reference standard\* :

2.0 CONSTRUCTION :

2.1 Degree of protection\* :

2.2 Sheet metal thickness \* mm :

2.3 Whether hermetically sealed ?\* :

2.4 Whether floor mounting type ?\* :

2.5 Floor mounting channel furnished ?\* :

2.6 Whether cable terminal box  
provided suitable for XLPE  
armoured cable ? :

2.7 Whether terminal for ground  
connection provided ?\* :

3.0 RATING AND CONNECTION

- 3.1 kVAR rating of H.T. Capacitor\* :
- a) :
- b) :
- c) :
- d) :
- e) :
- f) :
- 3.2 Rated voltage\* :
- 3.3 Voltage variation %\* :
- 3.4 Rated frequency\* :
- 3.5 Frequency variation %\* :
- 3.6 Whether the capacitor can operate  
on 110% rated voltage continuously\* :
- 3.7 Whether the capacitors are suitable\*  
for continuous operation at 1.3 times  
the rated current excluding transient :
- 3.8 3 phase unit size\* :

3.9 kVAR rating of unit\* :

3.10 Capacitance of unit\* :

3.11 Connection (Delta or Star)\* :

3.12 Insulation level\*

a) 1 min. power frequency kV :

b) Impulse kVp :

3.13 Capacitor losses :

3.14 Tangent of loss angle :

4.0 PROTECTION\*

4.1 Whether capacitors are protected  
Against overcurrent and short

Circuit :

4.2 Protection provided by :

4.3 Whether each capacitor unit is  
Protected against internal fault :

4.4 Protection provided by :

5.0 DISCHARGE RESISTOR\*

5.1 Whether discharge resistor for  
Individual capacitor provided ? :

5.2 Time taken to achieve the residual  
Voltage to 50 volts after switching  
off (min.) :

B. 415V

1.0 Capacitor data for L.T. load furnished? :

**F. POWER & CONTROL CABLES**

NOTE: 1. The Tenderer must submit along with the Bid atleast those data which  
are marked with asterisk (\*).  
2. After award of contract, the successful Tenderer shall resubmit  
completely filled in datasheets.

H.V.	L.V.	Control
Cable	Cable	Cable

1. Make\* :

2. Type\* :

3. Applicable Standard\* :

4. Voltage Grade\* :
5. Suitable for System with :-
  - a) Service Voltage :
  - b) Neutral Time :
6. Maximum Conductor Temp.\*
  - a) Continuous ... deg.C :
  - b) Short Time ... deg.C :
7. Conductor :
  - a) Material\* :
  - b) Size ... Sq.mm :
  - c) No. & Diameter of wire in Each conductor :
8. Shielding On Conductor\* :
  - a) Material :
  - b) Type :
  - c) Thickness ... mm :



			H.V. Cable	L.V. Cable	Control Cable
9.	Insulation*	:			
	a) Material	:			
	b) Type	:			
	c) Thickness	... mm :			
10.	Shielding on Insulation*	:			
	a) Material	:			
	b) Type	:			
	c) Thickness	... mm :			
11.	Inner Sheath	:			
	a) Material*	:			
	b) Type*	:			
	c) Thickness*	... mm :			
	d) Extruded ? *	.. Yes/No :			

- d) Approx. Outside dia over Sheath      ... mm      :
12.    Armouring      :
- a) Material\*      :
- b) Size\*      ... No x dia.      :
- b) D.C. Resistance at 20 deg.C      ... Ohm/Km      :
13.    Overall Sheath      :
- a) Material\*      :
- b) Type\*      :
- c) Thickness\*      :
14.    Approximate overall Diameter      ... mm      :
15.    Standard drum length with tolerance      ... mm      :
16.    Net Weight of Cable      ... Kg/Km      :

H.V.	L.V.	Control
Cable	Cable	Cable

17. Continuous Current Rating for  
Standard IS Condition laid Direct :  
  
a) In Ground :  
  
b) In Duct :  
  
c) In Air :  
  
18. Short Circuit Current for  
1 Sec. ... KA :  
  
19. Electrical Parameters at maximum  
operating temperature :  
  
a) Resistance ... Ohm/Km :  
  
b) Reactgance at  
50 C/s. ... Ohm/Km :  
  
c) Impedence ... :  
  
20. Recommended minimum bending  
Radius :  
  
21. Derating Factor for following  
Ambient Temp. in Air/Ground :  
  
22. Group Factor for following Nos. of  
Cables laid Touching/ 2 x diameter  
Centre to centre apart :

a) Single Core cable  
(in trifoil)

i) 2 Nos. :

	H.V.	L.V.	Control
	Cable	Cable	Cable

ii) 3 Nos. :

iii) 4 Nos. :

b) Multicore Cabale

i) 3 Nos. :

ii) 4 Nos. :

iii) 5 Nos. :

iv) 6 Nos. :

## SECTION-V

### PROPOSAL EXHIBIT SHEETS

#### SCHEDULE III

### Deviations

The Tenderer shall furnish an exhaustive list of deviations, if there is any, in their proposal. Tender not complying with Tender specifications are liable to be summarily rejected. No exceptions/deviations to the Tender specifications shall be recognized unless expressly set forth herein and all other terms & conditions of the Tender specifications remain in full force and effect. If no exceptions or deviations are proposed by the Tenderer, it shall be so stated clearly.

All exceptions and deviations from the Tender specifications shall be submitted in the enclosed format clause by clause. Failure to complete the enclosed format may be cause for rejection of the bid.

The enclosed format is for bid evaluation only and will not be a part of the contract. Only those exceptions and deviations which are accepted by the Purchaser will form part of the contract.

Sl. No.	Section No./ Drawing No.	Clause No.	Description of Deviation	Whether agreeable to withdraw, if insisted by Purchaser (Yes/No)	Price Implication (Yes / No)

## **SPECIFIC TERMS & CONDITIONS FOR SUBMITTING THE OFFER**

- 1) **SCOPE:** Scope as per Annexure 1(A)
- 2) **STYLE OF QUOTATION :** TWO PART SINGLE STAGE SYSTEM
  - a) The tender will be on two part system. Part-I consisting of techno-commercial part (except price) & Part-II consisting of price only as per enclosed format (Annexure-1,2,3,4,5 & 6). After evaluation of the Techno commercial offers, the price part of the suitable parties will be opened.
  - b) Quotations are to be submitted in 'DUPLICATE' and to be typewritten or printed on vendor's letterhead. Any correction or over writing should be authenticated.
- 3) **PART-I, TECHNO COMMERCIAL BID (UNPRICED)**

It shall contain

  - a) Earnest Money Deposit.
  - b) Commercial terms & conditions of sale
  - c) Blank (unpriced) price bid proforma (copy of your price part without price).
  - d) All documents in support of your credentials (see **PRE-QUALIFICATION CRITERIA (PQC) indicated below.**
- 4) **PART-II, PRICE BID:** This part shall contain "Price" as per enclosed format 1, 2, 3, 4, 5 & 6.
- 5) **MODE OF SUBMISSION OF TENDER**
  - a) Both parts of the offer should be sealed and super scribed with tender reference no., due date, Part No. i.e. Part-I for techno-commercial bid and Part-II for price bid and bidder's name & address.
  - b) Personal delivery is recommended. Tenderers forwarding tender by mail shall do so at their own risk. Tender received after the due date & hour may not be entertained. All envelopes duly sealed should be addressed to the Dy. General Manager (Purchase), Uranium Corporation of India Ltd., P.O. Jaduguda Mines, East Singhbhum, Jharkhand –832 102. Incomplete offers are likely to be rejected / ignored.
  - c) Offer shall **NOT** be sent by E-mail or Fax.
- 6) **DELIVERY SCHEDULE:** Tentative delivery schedule shall be within 9 months from the date of placement of LOI / purchase order. However, delivery schedule as in our purchase order shall apply.
- 7) **PRICE:** Your quoted rates should be on landed cost basis i.e. inclusive of basic price, all statutory duties & taxes, freight, insurance & unloading charges. Concessional rate of sales tax should be considered to quote your price. Please quote your price as per enclosed price format.
- 8) **PRICE TERMS:** Offers must be submitted on FOR DESTINATION basis for supply by road.

\* TURAMDIH is located at about 7 KMs from TATANAGAR RLY STATION.
- 9) **BASIS OF EVALUATION:** The total lowest cost arrived under price format (6) which will be the landed cost on turnkey basis will be considered as the basis for award of contract to the successful bidder.
- 10) **FIRM PRICE:** The price should be firm till execution of entire order quantity.

11) **PAYMENT TERMS:**

a) **DESIGN & DRAWING**

- a) 60% of Design value with 100% of taxes and duties will be paid within 30 days from the date of initial submission of design documents and drawings as per delivery schedule.
- b) 20% of Design value with 100% of taxes and duties will be paid within 30 days from the date of final submission of approved design documents and drawings.
- c) 10% of Design value with 100% of taxes and duties will be paid within 30 days along with installation and commissioning charges.
- d) Balance 10% of the design value will be released within 30 days of taking over from the bidder and submission of PBG.

b) **SUPPLY PART**

- a) 60% of Supply value with 100% of taxes and duties will be paid against receipt within 30 days.
- b) 20% of Supply value will be paid within 30 days of acceptance of material.
- c) 10% of Supply value will be paid within 30 days of erection and commissioning.
- d) Balance 10% of the supply value will be released within 30 days of taking over from the bidder after submission of BG of equivalent value, valid till defect liability period

c) **ERRECTION & COMMISSIONING CHARGES**

- a) 90% of E & C charges with 100% of taxes and duties will be paid within 30 days of E & C.
- b) Balance 10% of the E & C charges will be released within 30 days of handing over against after submission of BG of equivalent value valid till defect liability period

12) **VALIDITY:** The offer should remain valid for 180 days from the date of opening of the tender.

13) **EARNEST MONEY DEPOSIT:** As per our "Instructions to tenderer and general conditions of contract" (enclosed). The E.M.D amount shall be Rs. 8 lakhs only (Rupees eight lakhs only). Supplier registered with NSIC / SSI are exempted for submission of EMD.

14) **SECURITY DEPOSIT:** The successful bidder shall furnish a security deposit to the extent of 5% of the total value of the order within 15 days after the order is awarded. Such a deposit will be held by the Corporation until successful completion of the order/contract, and will bear no interest. It will be forfeited in the event of breach of contract. Security deposit may be in the form of a bank guarantee issued by/ counter guaranteed by an Indian nationalised bank in favour of URANIUM CORPORATION OF INDIA LTD.

15) **BANK GUARANTEE (B.G)**

- a) Bank guarantee should be as per our proforma & issued by an Indian nationalised bank.
- b) They shall be valid for periods as under:
  - a) For Security : Till satisfactory completion of order.
  - b) For Warranty : Till end of warranty period.

- c) Bank guarantee shall provide for claim period of 6 months after the expiry date.
- d) If the bank guarantee is furnished with validity period less than as stipulated above or in the likelihood of the order not being executed within the stipulated delivery schedule, it will be your responsibility to arrange for extension of the validity of BGs as necessary and furnish the same well in advance of the expiry of the bank guarantee failing which we will be at liberty to invoke the bank guarantee.

**16) PRE-QUALIFICATION CRITERIA (PQC):**

- a) The Tenderer shall have designed, manufacture, supplied and successfully commissioned at least 2 no. closed loop grinding circuit of capacity not less than 12 TPH, size not less than 7' diameter x 15' long and for material having work index of 16.5 or higher grinding mill, hydro-cyclone ,pumps and related equipments etc. during last three (03) years i.e., from 2010-11 to 2012-2013
- b) The Tenderer should have satisfactorily completed a single contract of supply, installation & commissioning costing not less than Rs. 4(four) Crore or two ENGINEERING, PROCUREMENT & COMMISSIONING works costing not less than 2(two ) crore each during last 3years.
- c) The Tenderer should have positive net worth. The Tenderer should have made profit before prior period adjustment and extraordinary items for at least two out of last three financial years (2010-2011, 2011-2012, and 2012-2013). Tenderer should also submit copy of balance sheet of three year as proof of fulfilling this criteria.

**17) ERECTION & COMMISSIONING:** The equipment along with spares after receipt and acceptance shall be erected and commissioned as per the agreed scheduled, by your service engineers upon written information from us.

**18) COMMISSIONING ON NO LOAD & FULL LOAD BASIS:** Charges for commissioning on NO LOAD and FULL LOAD basis of equipment supplied under this packages & performance testing as outlined in the scope of work.

**19) PERFORMANCE DEMONSTRATION AND TAKING OVER:**  
The entire system shall be operated continuously for a period of three days successfully at the rated capacity and NIT conditions. The system will be deemed to have been taken over after successful performance demonstration.

**20) OPERATION AND MAINTENANCE MANUAL:** Five (5) sets each of operation and maintenance manuals with all relevant drawings, spare part list, part no., MOC, etc. of complete system including bought out items must be handed over before performance demonstration. The manual shall contain Trouble shooting, interlock details, etc.

**21) PRORATA PENALTY CLAUSE:**

- a) If the magnetite mill gives a through put up to 90% of the guaranteed capacity then no penalty will be levied.
- b) In case though put will be less than 90% entire PBG i.e. 10% of the contract value will be revoked / forfeited.

**22) AGREED LIQUIDATED DAMAGE:** Time shall be the essence of the contract. If successful tenderer fails to execute the order within the agreed delivery schedule, he



shall be liable to pay as “agreed liquidated damages” a sum @ ½% of the contract value per week or part thereof of delay subject to a maximum of 5%.

- 23) **GUARANTEE / WARRANTY (DEFECT LIABILITY PERIOD):** The material shall be warranted against manufacturing defects, poor workmanship and mechanical and electrical inherent problems for a period of 18 months from the date of supply or 12 months from the date of commissioning, whichever is earlier. Defected material shall be repaired/replaced free of cost on “free at our site” basis. This shall be backed up by a B.G for 10% of the PO value valid for the warranty period as per our proforma enclosed.
- 24) **INSPECTION:** UCIL reserves the right for stage inspection at the supplier’s works. However acceptance of goods will be based on full inspection at UCIL site only. In the event of damage or loss of goods, supplier shall repair / replace the material free of cost at our satisfaction within 3 months of intimation.
- 25) **PREFERENCE:** Preference to PSU’s will be applicable as per Govt. guidelines in vogue. Party claiming exemption shall submit valid supporting documents along with their offer.
- 26) **RISK PURCHASE:** In the event of order not being executed satisfactorily, we reserve the right to purchase material from alternative sources at your risk and cost.
- 27) **CANCELLATION OF ORDER:** It will be your endeavour to execute the purchase order to our satisfaction. In case of your failure to do so, the order is liable to be cancelled.
- 28) **ASSURED SPARES AVAILABILITY:** The bidder shall confirm in writing that all spares & components of the equipment offered shall be made available for a minimum period of 10 years from the date of supply of the machine.
- 29) Other terms & conditions as in “Instructions to Tenderer & General Conditions of Contract” (enclosed) shall also apply.
-

## PRICE FORMAT- 1

### **DESIGN & ENGINEERING CHARGES:**

Design and engineering charges for:- [ The tenderer shall note the quoted price ,shall span from ' Designing up to and including Approval of drawing & documents , submission of requisite no. of final 'As built along with hard copies , tracings, transparencies & soft copies and also the operation & maintenance manual of the plant under this package MBM-01]

SL NO.	Equipment Description	Unit Price	Total Taxes & Duties, if any	Total
1	Design engineering services of magnetite ball mill, hydro cyclone, hydro cyclone feed pumps and other related item as per scope of work covered under this package, including submission & approval of drawings.			
2	Design & engineering of all civil foundation of equipments to be supplied, submission & approval of drawing.			
3	Design & engineering of all electrical and instrumentation systems to be supplied under this package, submission & approval of drawings.			
4	Design of layout fitting to existing set up.			
TOTAL				

Note: - the bidder shall mention under each head the tentative list of drawings along either offer to be submitted during detailed design and engineering.

## PRICE FORMAT - 2

### SUPPLY OF EQUIPMENTS:

The bidder shall mention all equipments required for completion of MAGNETITE BALL MILL as per scope of work and shall submit their price as per format given below:-

SL NO.	Equipment Description	Quantity	EX. Works Price	TAXES AND DUTIES			Total Taxes & Duties	Freight Insurance Including loading & Unloading	Total f.o.r site
				ED	CST/ VAT	other taxes & Duties			
1	Ball Grinding mill (complete with motor, HT switch gear, grid resistance starter, APFC panel for P.F improvement, gear box, auxiliary drive arrangement, HI-lift system, mounting arrangement, grid resistance starter and other related accessories)	1 No.							
2	Mill discharge sump (MSRL). The rubber used shall be soft rubber	2 No.							
3	Feed pumps to hydrocyclone with VVFD drive (1 no. running and 1 no. stand by complete with motor, drive arrangement, base plate, supporting frames and structure)	2 No.							
4	Hyrdocyclone with feeding arrangement (4 no.). 2 set cyclone of each mill discharge pump	4 No.							
5	Hydrocyclone underflow trough (MSRL) whose discharge will go to mill as feed	1 No.							
6	Hydrocyclone underflow discharge tundish (MSRL) and Hydrocyclone underflow tundish. The rubber used shall be soft rubber	2 No.							

7	M.C.C. (for normal supply) & local push button station	1 Set							
8	Mill area sump pump complete with motor	2 No.							
9	All the requirement instrumentation	1 Lot							
10	Any other equipment required								
								Grand total Rs.	

**PRICE FORMAT - 3**

**ERECTION & INSTALLATION CHARGES:**

Charges for erection & installation of equipments supplied under this package including all taxes and duties :

Rs. \_\_\_\_\_ (Lump sum) \_\_\_\_\_

**PRICE FORMAT – 4**

**COMMISSIONING CHARGES:**

Commissioning charges on NO load and full load basis of equipment supplied under this package including all taxes and duties:

Rs. \_\_\_\_\_ (Lump sum) \_\_\_\_\_

**PRICE FORMAT -5**

**(A) ESSENTIAL SPARES:**

The bidder shall supply under mentioned (A) essential spares along with equipments, covered under the scope of supply for the Magnetite Ball Mill & (B) Consumables and shall submit their prices as per format given below.

SL NO.	Equipment Description	Quantity	EX. Works Price	TAXES AND DUTIES			Total Taxes & Duties	Freight Insurance Including loading & Unloading	Total F.O.R site
				ED	CST /VAT	other taxes & Duties			
1	<b>Spare for new ball mill</b>								
	a) Countershaft with pinion , bearing & plumber block	1 set							
	b) Mill drive gear box	1 No.							
	c) Feed sleeve*	1 set							
	d) Mill head liners with nuts & bolts	1 set							
	e) Mill liners	1 set							
	f) Trunnion bearings both ends	1 No. Each							
	g)Trommel **	1 No.							
	h) Mill drive coupling	1 set							
	i) Feed chute***	1 No.							
2	<b>Spare for Hydrocyclone feed pump</b>								
	a) Shaft	2 No.							
	b)Shaft sleeve	2 No.							
	c)Impeller	2 No.							
	d) Casing liner	2 set							
	e) Inlet liner	2 set							

3	<b>Spare Hydrocyclone for</b>								
	a) Whole cyclone liners	2set							
	b) Apex insert #	6 No.							
	c) Vortex finder ##	6 No.							
4	<b>Spare for M.C.C</b>								
	a) Indicating lamps	10No.							
	b) Overload relay	1 No. each type							
	c) contractor	1 No. each type							
	d) Switches	1 No. each type							
(A) TOTAL(Rs.)									

Essential spares

- For Apex insert # & vortex finder ##, one size smaller and one size larger than the original size (2 no. each size) should be supplied.
- Feed sleeve \* and feed chute \*\*\* should be fitted with replaceable and wear resistant chrome steel liner.
- Trommel \*\* should be made up of MSRL.

**(B) CONSUMABLES SPARES:**

SL NO.	Equipment Description	UNIT	Quantity	EX. Works Price	TAXES AND DUTIES			Total Taxes & Duties	Freight Insurance Including loading & Unloading	Total F.O.R site
					ED	CST/VAT	other taxes & Duties			
1	Knife edge gate valve with rubber sleeve	No.								
2	Grinding media	MT								

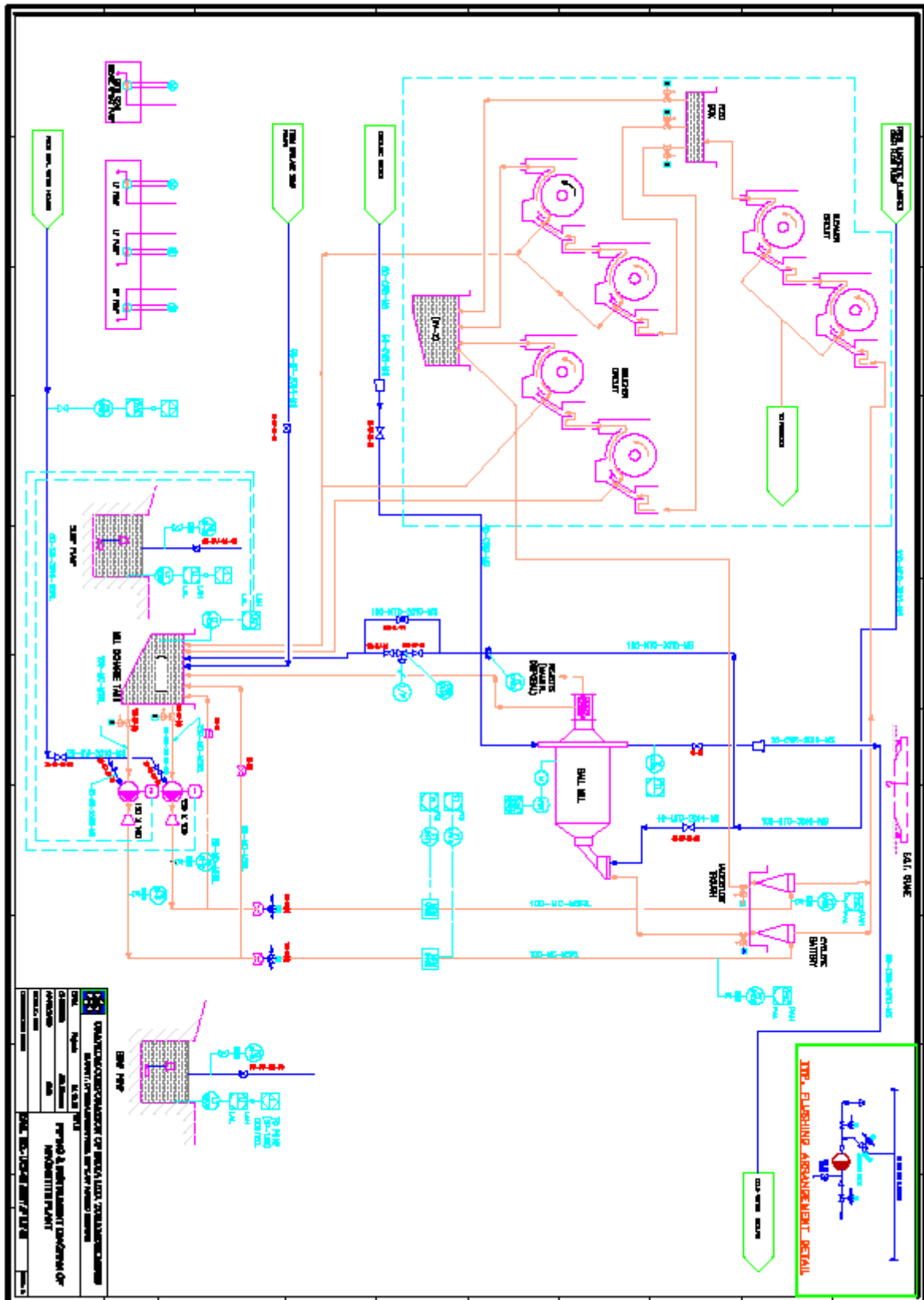


3	Other (please specify)									
(B) Total ( Rupees)										
GRAND TOTAL (A)+(B) Rupees										

**PRICE FORMAT -6**

Sl.No.	Description	TOTAL AMOUNT (Rs.)
1	Design & Engineering charges (as per price format-1)	
2	Supply of Equipments (as per price format-2)	
3	Erection & Installation charges (as per price format-3)	
4	Commissioning charges (as per price format-4)	
5	Essential & Consumables spares (as per price format-5)	
6	GRAND TOTAL (in figure and word )	

**SECTION –VI**  
**DRAWINGS**





## **INSTRUCTIONS TO TENDERER AND GENERAL CONDITIONS OF CONTRACT**

**Tenderers are required to give their sealed Tender in duplicate.**

**No Tender shall be considered if:**

- a) Tenders are received after the specified date and time.
- b) The quotations are not legible and contain overwriting.
- c) Prices are tendered telegraphically on the due date and not confirmed subsequently.
- d) All the pages of offer are not signed by competent and authorised persons. Any person given a tender shall furnish documentary evidence that his signature on the tender, submitted by him is legally binding upon himself, his firm or company as the case may be.

**Prices:** The prices quoted must be net per unit quantity Sales tax/Excise duty, packing and delivery charge if applicable should be shown separately. Wherever necessary the prices may be shown separately if the material or part is imported.

Prices shall be given as under:

- a) F.O.R. destination (Jaduguda / Narwapahar / Turamdih) by road.
- b) If the item is imported, break up shall be furnished indicating:
  - i) F.O.B. port of shipment in foreign currency.
  - ii) Insurance & freight up to Calcutta Port.
  - iii) Foreign Exchange rate.
  - iv) Customs tariff heading and custom's duty.
  - v) Clearance & charges for delivery at Jaduguda.

**Acceptance of Tender:** The final acceptance of the tender rests with UCIL, who reserves to itself the right to reject any or all tenders without assigning any reason. It does not bind itself to accept the lowest or the whole of a tender. Order may be placed on more than one tenderer.

**Validity:** The prices should remain firm for acceptance for 180 days from the date of opening of the tender.

**Responsibility of Completeness:** Goods quoted for must be complete in all respect. Any fittings or accessories which may not be specifically mentioned in the specification but which are usual or necessary are to be provided by the Tenderer without extra charges.

**Quantity:** The Corporation reserves the right to order less or more than the specified quantity at the offered rates.

**Insurance:** Transit insurance should cover all risks upto the destination. Insurance will be arranged by the Corporation or the supplier depending on the basis of the contract.

**Earnest Money: Offers** should be accompanied by an earnest money deposit, without which, the offer is liable to be rejected.

The amount of the EMD shall be as stipulated under "SPECIFIC TERMS & CONDITIONS FOR SUBMITTING OFFER".

E.M.D. shall be in the form of a demand draft drawn on State Bank of India, Jaduguda Branch (code No. 0227) or Jamshedpur Branch of any Indian Nationalised bank drawn in favour of URANIUM CORPORATION OF INDIA LTD. If the EMD amount is more than Rs. 1,00,000/-. EMD may be by way of a bank guarantee issued by any Indian Nationalised Bank. E.M.D. shall not bear any interest.

**Security Deposit:** The successful bidder shall furnish a security deposit to the extent of 5% of the total value of the order, before the order is awarded. Such a deposit will be held by the Corporation until successful completion of the order/contract, and will bear no interest. It will be forfeited in the event of breach of contract. Security deposit may be in the form of a bank guarantee issued by/ counter guaranteed by an Indian Nationalised bank in favour of URANIUM CORPORATION OF INDIA LTD.

**Inspection:** UCIL reserves the right of stage and/or pre-dispatch inspection for which due notice shall be given by the supplier. However, final inspection shall be done on receipt of goods at destination.

**Capability:** List of customers of repute with Photostat copies of order may be submitted along with your offer.

**Rejection of Goods:** UCIL reserves the right to reject goods which are not as per specification and also if supplied in breach of the terms & conditions stipulated. In case of rejection you shall have to replace free of cost or refund the amount paid.

UCIL shall be entitled to recover from the supplier costs incurred by UCIL in respect of the rejected goods. Rejected goods will be lying at the UCIL's store at the supplier's risk and shall be removed by the supplier at his own cost immediately on receipt of rejected advice. The Corporation will not be responsible for any loss on account of deterioration etc. of the rejection goods. If rejected goods are not removed by the supplier, UCIL may charge penal rent and dispose off the goods as deemed.

**Failure and Termination of Contract:** When once the tender is opened, the tenderer is bound to abide by the rate, delivery and other terms & condition quoted by him. For any default in this connection or withdrawal of the quotation, the earnest money deposit shall be forfeited. If the tenderer fails to deliver any stores in accordance with to the terms & conditions, as per specifications stipulated, replace any stores rejected within such time as may be stipulated or breach of contract in any other way, the Corporation shall be entitled to anyone or more of the following:

- a) Cancel the contract, wholly or partly.
- b) Forfeit the earnest money and/or security deposit
- c) Impose penalty ranging from 3% to 10% of the contract value.
- d) To Procure from alternative sources and recover extra cost incurred by the Corporation.
- e) Removal of supplier's name from the approved list of suppliers.
- f) To receive from the tenderer as agreed liquidated damages a sum equal to half a percent of the value of the stores which the tenderer fails to deliver per each week or part thereof during which the delivery of such stores may be in arrears.
- g) Recovery of Liquidated damages.

In the event of action taken under clause (d) and (f) above, the tenderer shall be liable for any loss which the Corporation (UCIL) may sustain on that account but the tenderer shall not be entitled to any saving on such purchases made against default.

The decision of the Corporation (UCIL) shall be final as regards the

- acceptability of stores supplied by the tenderer and the Corporation.
- shall not be required to give any reason in writing or otherwise at
- any time for the rejection of the Stores.

**Warranty Clause:** The tender shall declare that the goods/stores/articles sold to the Corporation, (UCIL) under contract shall be of the best quality, workmanship and shall be strictly in accordance with the specifications and duty parameters contained in the contract. The corporation reserves the right to call for a performance guarantee backed by a bank guarantee. Notwithstanding the fact that the Corporation (UCIL), or any person on its behalf, may have inspected and/or approved the said goods/stores/articles, if it be discovered not to conform to the description and quality aforesaid or deteriorated goods may be rejected. On such rejection all the provisions relating to 'Rejection of goods' shall apply. The tenderer shall, if so called upon, replace the good, or such portion there of as is rejected by the Corporation and compensate such damages as may arise by reason of the break of the condition here in contained. Nothing, here in contained shall prejudice any other right of the corporation (UCIL) in that behalf under a contract or otherwise.

**Payment terms:** Unless otherwise agreed to, payment will be made within 30 days of receipt and acceptance of goods.

**Force Majeure:** In the case of strikes/lockouts, closure of works (whole or partial) breakdown of machinery, act of God or any other cause beyond the control of the Corporation preventing or hindering the normal operation, the Corporation shall be at liberty to cancel this order at any time before receipt of the goods without being liable to the supplier for damages or other claims.

**Disputes:** Both parties agree in, disputes arising out of this order may be settled by arbitration, in accordance with the Indian arbitration Act, 1940 by a sole arbitrator who shall be appointed by the Chairman & Managing Director of this Corporation (UCIL).

**Jurisdiction:** This agreement/order shall be deemed to have been executed at Jaduguda, District Singhbhum (East), Jharkhand and it is subject to the jurisdiction of the court of Law in Ghatsila only irrespective of anything to the contrary that may be mentioned in the offer of the tenderer.

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## **PROFORMA FOR BANK GUARANTEE AGAINST EARNEST MONEY DEPOSIT**

To,

Uranium Corporation of India Limited  
P.O. Jaduguda Mines,  
Dist: East Singhbhum (Jharkhand)  
Pin: 832 102

Dear Sir,

In accordance with invitation to Bid under your Tender no. \_\_\_\_\_, M/s (Supplier's name & address) hereinafter called the (Bidder) wish to participate in the said bid for supply of (Material Description & Quantity) and you, as a special favour have agreed to accept an irrevocable and unconditional, Bank Guarantee for an amount of Rs. \_\_\_\_\_ valid up to \_\_\_\_\_ on behalf of the bidder in lieu of the Earnest Money Deposit (EMD) by way of demand draft required to be made by the bidder, as a condition precedent for participation in the said bid.

We, (Banker's name & address) guarantee and undertake to pay immediately on demand by Uranium Corporation of India Limited, the amount of Rs \_\_\_\_\_ (Rupees \_\_\_\_\_) without any reservation, protest, demur and recourse. Any such demand made by the said owner shall be conclusive and binding on us irrespective of any dispute or difference raised by the bidder.

This Guarantee shall be irrevocable and shall remain valid upto and including (Validity of offer + 6 months). If any further extension of this guarantee is required, the same shall be extended to such required period (not exceeding one year) on receiving instructions from M/s (Supplier's name) on whose behalf this guarantee is issued.

AND WE, (Bankers) lastly agree that our liability hereunder shall not be discharged by virtue of agreements between UCIL and the supplier whether with or without our knowledge, and / or consent or by reason of UCIL showing any indulgence or forbearance to the supplier whether as to payment, time, performance or any other matter whatsoever or any modification of the said contract which but for this provision would amount to discharge of the surety under the law.

This guarantee shall not be revoked by us whether before its coming into force or any time during its currency without your previous consent in writing.

AND WE, (Bankers) also agree that our liability hereunder shall not be discharged by any change in the constitution of this bank or the firm of supplier. Our liability under the guarantee shall not in any event whatsoever exceed the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_).

Our guarantee shall remain in force until (date) or such further date up to which this bank guarantee is renewed or extended and unless a claim under the guarantee is lodged with us within 6 (six) months from such date all rights of UCIL under the guarantee shall be forfeited and we shall be relieved and discharge from all liabilities thereunder.

NOTwithstanding anything contained herein:

- i. Our liability under this Bank Guarantee shall not exceed Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_)
- ii. This Bank Guarantee shall be valid upto \_\_\_\_\_.

- iii. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before \_\_\_\_\_.

For the purpose of enforcing legal rights / remedies under this guarantee we agree that the court of law of GHATSILA, Singhbhum East, Jharkhand State shall have exclusive jurisdiction.

We have power to issue this guarantee and the undersigned has full power to sign this guarantee on our behalf under POWER OF ATTORNEY granted to him by the Bank.

Dated at (Place) this \_\_\_\_\_ day of \_\_\_\_\_ 201\_\_\_\_

For (BANKER'S NAME)

\_\_\_\_\_  
Signature  
  
(Name in Capital letter)  
Designation \_\_\_\_\_

\_\_\_\_\_  
Signature  
  
(Name in Capital letter)  
Designation \_\_\_\_\_

## **PROFORMA FOR BANK GUARANTEE AGAINST SECURITY DEPOSIT**

TO

URANIUM CORPORATION OF INDIA LIMITED  
P.O. JADUGUDA MINES,  
DIST: EAST SINGHBHUM (JHARKHAND)  
PIN : 832102

Sir,

WHEREAS on or about the \_\_\_\_\_ day of \_\_\_\_\_ M/s (Supplier's name & address), a Company / Firm registered under (companies Act 1956/.....) and having its registered office situated at (Postal address) (herein after referred to as 'The Supplier') entered into a contract bearing reference no. \_\_\_\_\_ dtd. \_\_\_\_\_ with Uranium corporation of India Limited., (A Govt. of India Enterprises), P.O. Jaduguda Mines, Dist: Singhbhum East, Jharkhand – 832102 (herein after referred to as UCIL) for supply (details of order) (herein after referred to as 'The Contract').

AND WHEREAS under the terms and conditions of the contract the supplier is required to keep with UCIL a security deposit of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) or submit a Bank Guarantee in lieu of cash deposit for the fulfillment of the terms and conditions of the contract, and whereas the supplier has chosen to submit a Bank Guarantee.

NOW WE (Bankers) hereby agree and undertake to indemnify UCIL and keep UCIL indemnified to the extent of a sum not exceeding the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) against any damage or loss that may be suffered by UCIL by reason of non-fulfillment of any of the terms and conditions of the contract by the supplier.

AND WE, (Bankers) hereby undertake to pay on demand in writing by UCIL or any officer of UCIL within 48 hours and without any demur to UCIL on behalf of the supplier any sum of sums not exceeding in the total Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) as may be claimed by UCIL as the damages or loss that UCIL may have suffered by reasons of the non-fulfillment of any particular terms and conditions of the contract by the supplier.

We undertake to pay to you any money so demanded notwithstanding any dispute or disputes raised by the supplier in any suit or proceeding pending before any court or tribunal or arbitrators relating thereto.

AND WE, (Bankers) hereby further agree that the decision of UCIL as to whether the supplier has committed breach of any such terms & conditions of the contract or not and assessment of UCIL as to the amount of damages or loss suffered by UCIL on account of such breach would be final and binding on us and it need not be established.

AND WE, (Bankers) lastly agree that our liability hereunder shall not be discharged by virtue of agreements between UCIL and the supplier whether with or without our knowledge, and / or consent or by reason of UCIL showing any indulgence or forbearance to the supplier whether as to payment, time, performance or any other matter whatsoever or any modification of the said contract which but for this provision would amount to discharge of the surety under the law.

This guarantee shall not be revoked by us whether before its coming into force or any time during its currency without your previous consent in writing.

AND WE, (Bankers) also agree that our liability hereunder shall not be discharged by any change in the constitution of this bank or the firm of supplier. Our liability under the guarantee shall not in any event whatsoever exceed the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_).

Our guarantee shall remain in force until (date) or such further date up to which this bank guarantee is renewed or extended and unless a claim under the guarantee is lodged with us within 6 (six) months from such date all rights of UCIL under the guarantee shall be forfeited and we shall be relieved and discharge from all liabilities thereunder.

For the purpose of enforcing legal rights / remedies under this guarantee we agree that the court of law of GHATSILA, Singhbhum East, Jharkhand State shall have exclusive jurisdiction.

We have power to issue this guarantee and the undersigned has full power to sign this guarantee on our behalf under POWER OF ATTORNEY granted to him by the Bank.

Dated at (Place ) this \_\_\_\_\_ day of \_\_\_\_\_ 201 \_\_\_\_\_

For (BANKER'S NAME)

\_\_\_\_\_  
Signature  
(Name in Capital letter)  
Designation \_\_\_\_\_

\_\_\_\_\_  
Signature  
(Name in Capital letter)  
Designation \_\_\_\_\_

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**NOTE TO SUPPLIERS :**

- i) BANK GUARANTEE submitted by you should be sent to us directly by the issuing bank under Registered Post (A.D).

**NOTE TO ISSUING BANK :**

- i) In case you desire to submit the BANK GUARANTEE directly to us, you are requested to send by Registered Post (A.D) an unstamped duplicate copy of the guarantee directly to us with a covering letter to compare with the original BGs and confirm that it is in order.

## **PROFORMA FOR BANK GUARANTEE AGAINST WARRANTY**

TO

URANIUM CORPORATION OF INDIA LIMITED  
P.O. JADUGUDA MINES,  
DIST: EAST SINGHBHUM (JHARKHAND)  
PIN : 832102

Sir,

WHEREAS M/s (Name and full address) (hereinafter referred to as the 'contractor' received an order bearing reference number \_\_\_\_\_ dated \_\_\_\_\_ (hereinafter referred to as the 'Contract') from Uranium Corporation of India Limited, P.O. Jaduguda Mines, District: Singhbhum, Jharkhand – 832102 (hereinafter referred to as 'UCIL') for the supply of \_\_\_\_\_.

And whereas the contractor is required to guarantee that the goods supplied is free from defects in its material of construction workmanship and its performance and further required to rectify by repair or replacement free of all costs to UCIL any defect / defects in the goods and / or its performance, if noticed within the warranty period stipulated.

And whereas UCIL has agreed to pay the contractor the full value (inclusive of duties and taxes) of the goods supplied on the contractor furnishing a bank guarantee in the manner here in contained for a sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) to cover the said guarantee.

Now we (the Banker) hereby agree and undertake to indemnify UCIL and keep UCIL indemnified to the extent of a sum not exceeding the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) against any damage or loss that may be suffered by UCIL by reason of non-fulfillment of the obligations under the said guarantee by the contractor.

AND WE, (Banker) hereby undertake to pay on demand in writing by UCIL or any officer of UCIL within 48 hours and without any demur to UCIL on behalf of the supplier any sum or sums not exceeding in the total Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) as may be claimed by UCIL as the damages or loss that UCIL may have suffered by reasons of the non-fulfillment of any particular terms and conditions of the contract by the suppliers.

We undertake to pay to you any money so demanded notwithstanding any dispute or disputes raised by the supplier(s) in any suit or proceeding pending before any court or Tribunal or arbitrators relating thereto.

AND WE (Bankers) hereby further agree that the decision of UCIL as to whether the contractor has committed breach of any such terms and conditions of the contract or not and assessment of UCIL as to the amount of damages or loss suffered by UCIL on account of such breach would be final and binding on us and it need not be established.

AND WE, (Bankers) lastly agree that our liability hereunder shall not be discharged by virtue of arrangements between UCIL and the supplier whether with or without our knowledge, and / or consent or by reason of UCIL showing any indulgence or forbearance to the supplier whether as to payment, time, performance or any other matter whatsoever or any modification of the said contract which but for this provision would amount to discharge of the surety under the law.

This guarantee shall come into force simultaneously with your making the payment to the supplier and shall not be revoked by us whether before its coming into force or any time during its currency without your previous consent in writing.

AND WE, (Bankers) also agree that our liability hereunder shall not be discharged by any change in the constitution of this bank or the firm of supplier. Our liability under the guarantee shall not in any event whatsoever exceed the sum of Rs.\_\_\_\_\_ (Rupees\_\_\_\_\_).

Our guarantee shall remain in force until\_\_\_\_\_ (date)\_\_\_\_\_ or such further date up to which this bank guarantee is renewed and unless a claim under the guarantee is lodged with us within 6 (six) months from such date, all rights of UCIL under the guarantee shall be forfeited and we shall be relieved and discharge from all liabilities thereunder.

For the purpose of enforcing legal rights / remedies under this guarantee we agree that the court of law of GHATSILA, Singhbhum East, Jharkhand State shall have exclusive jurisdiction.

We have power to issue this guarantee and the undersigned has full power to sign this guarantee on our behalf under POWER OF ATTORNEY granted to him by the Bank.

Dated at (Place) this \_\_\_\_\_ day of \_\_\_\_\_ 201\_\_

For (BANKER'S NAME)

\_\_\_\_\_  
Signature  
(Name in Capital letter)  
Designation \_\_\_\_\_

\_\_\_\_\_  
Signature  
(Name in Capital letter)  
Designation \_\_\_\_\_